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ABSTRACT

This report describes the development of a project designed to enable new users of desktop publishing technologies to produce typeset documents which approach or match commercial quality standards. "Typesetting--A Tutorial for the Desktop Publisher" is a computer assisted instructional (CAI) program that provides students with an understanding of the traditional language of type while developing familiarity with the rules of page layout and design. The design and development of the programmed tutorial is grounded on three assumptions: (1) the main focus of the CAI course must be on enabling operators with non-specialized skills to learn the fundamentals of typesetting; (2) new desktop publishing personnel productivity can be dramatically increased, and learning curves reduced, by a computerized course in which learners control their own pace while learning the elements, principles, and language of typesetting; and (3) operators must know when, how, and why to utilize the tools that are available to them, thus the concepts surrounding document production must be familiar to them. Results of administration of the CAI course indicated a high level of student interest in CAI as a medium of instruction. The flexibility of the user interface provided an impetus for student exploration. Excitement with the tools for learning and the stimulation to interact and play with the media were key factors in the general success of the learning event. The ability of individual students to guide themselves and manipulate their private learning environments were challenges to which participants responded strongly. (14 references) (DB)

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The Faculty of the
School of Media and Arts
of The New York Institute of Technology

accepts the
Thesis/Project

A COMPUTER BASED TRAINING PROGRAM ON TYPESETTING FOR DESKTOP PUBLISHING PROFESSIONALS

This project was conducted using the principles and techniques of instructional system design (ISD). The document is a report of the designer's plans and experiences in carrying out the design, development, implementation, and evaluation of the project. A plan, budget, analysis of findings, and recommendations are included.

written by

Andrew Gelfand

in partial satisfaction
of the requirements for the degree of

Master of Science

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Dr. Angus Reynolds
Associate Dean, Graduate Programs
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August 1, 1991

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A COMPUTER BASED TRAINING PROGRAM ON TYPESETTING FOR DESKTOP PUBLISHING PROFESSIONALS

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A Thesis/Project

submitted to The Faculty of the

School of Media and Arts

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August 31, 1991

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TABLE OF CONTENTS

ACKNOWLEDGEMENTS iii

LIST OF TABLES vi

LIST OF FIGURES vi

Chapter

1. INTRODUCTION 1

Overview 1
Background 2
Statement of the Problem 4
Purpose of the Project 5
Definition of Terms 6
Assumptions 7
Limitations 8
Methods and Procedures 8
Summary 10

2. ANALYSIS 12

Introduction 12
Needs Analysis 12
Instructional Goal 16
Literature, Existing Course and Material Review 18
Plan for Design and Development Effort 27
Summary 29

3. DESIGN 30

Introduction 30
Instructional Task Analysis 30
Instructional Objectives 31
Establishment of Required Entry Behaviors 33
Group and Sequence Objectives 34
Learning Activities Specification 34
Assessment System Specification 35
Evaluation System Specification 36
Learning Transfer System Specification 38
Review and Selection of Existing Materials 39
Summary 39

4. DEVELOPMENT 40

Introduction 40
Learning Activity Development Scheme 40
Learning Activity Development 41
Learning Activity Review 49
Materials for Evaluation Produced 49
Summary 52

5. IMPLEMENTATION 53

Introduction 53
Materials for Implementation Reproduced 53
Instructional Delivery 53
Data Collection 55
Summary 56

6. EVALUATION 57

Introduction 57
Formative Evaluation 57
Summative Evaluation 62
Learning Transfer 70
Summary 72

7. SUMMARY AND RECOMMENDATIONS 74

Introduction 74
Methods and Procedures Used 74
Conclusions 77
Recommendations 78
Concluding Statement 80

APPENDIX A. PROJECT GANTT CHART 82

APPENDIX B. TASK ANALYSIS 84

APPENDIX C. PROGRAM CODE 87

APPENDIX D. CRITERION REFERENCED QUIZ SAMPLE 91

APPENDIX E. EVALUATION INSTRUMENTS 93

APPENDIX F. ORIGINAL STORYBOARD DESIGN 99

BIBLIOGRAPHY 100

LIST OF TABLES

Table **Page**

1. Project Cost.......29
2. Learning Activity Instructional Strategy Matrix.......35
3. Small Group Trial Results.......61
4. Summative Questionnaire Results.......64
5. Summative Evaluation Results.......66
6. Coporate Implementation Cost vs. Savings.......69
7. Projected Savings.......70

LIST OF FIGURES

Figure

1. Course Flow Diagram.......44

CHAPTER 1

INTRODUCTION

Overview

The rapid advent of micro-computer-based technologies and applications software for page layout and typesetting has created a number of unique problems and challenges for new computer users: 1) the tools which technology has provided cannot, in themselves, replace the specialized knowledge and judgement associated with achieving commercial publishing standards; 2) the cost of training, maintaining and keeping personnel skilled with publishing technologies continues to rise while the price of the technology falls and 3) the learning curve necessary to acquire the skills associated with quality use of type are extensive.

"Typesetting—A Tutorial for the Desktop Publisher" is a training program designed to introduce the new user of desktop publishing technologies to the basic terminology and principles of typesetting. The course aims at addressing the explicit needs of users within the corporate environment by rapidly providing students with an understanding of the traditional language of type while developing familiarity with the rules of page layout and design.

Through the use of this tutorial students develop a comprehension of typesetting which will facilitate better document design, fewer revisions, and improved delivery of the written message. Users will learn when to employ their application resources for more effective communication and the knowledge and skills acquired will be directly transferable to the full range of applications using type.

Computer Assisted Instruction (CAI) has been selected as the most appropriate strategy for project implementation. CAI has, as a delivery medium, a number of unique benefits associated with it, in addition to its natural fit with the modern computerized office environment: Key advantages of CAI as a vehicle for educational delivery include:

- individualized instruction, increased interaction and learner control
- a portable and decentralized learning environment
- ease of administration, testing, and record keeping
- low implementation costs
- ease of distribution and delivery

Background

The graphic arts industry has undergone a profound transition in the past ten years. The number of typesetting services, once numbering in the tens of thousands, has diminished in size by over 70 percent There are now estimated to be under 4,000 type shops engaged in the traditional "craft" of typesetting.

A number of factors are responsible for the general demise of the traditional typesetting industry: 1) the widespread adaptation of personal computers provoked a shift from mini-computer-based technologies, popular in the 70's and early 80's, to micro-based systems having more power and functionality for less price; 2) intelligent composition software made it possible to evolve from galley-based typesetting and composition to full page makeup; 3) the advent of the 300 dpi (dots per inch) laser printer and access to digital font libraries provided mass access to the tools and medium for creating "typeset" pages; 4) the adoption of a standard page description language (PostScript) which would allow text and graphics integration to be accomplished simultaneously at different resolutions; 5) the movement away from code-driven markup to interactive layout tools, and; 6) the movement of the production process out of the commercial market directly into the hands of the end buyer of type—namely corporate America.

The actual process of typesetting has until recently been considered something of a fine art. Traditionally the domain of well trained, highly skilled, compositor/ designers, who learned their craft through years of intensive apprenticeship, the typesetting industry has undergone radical shifts as a result of computerization. The rapid advent of microprocessor-based electronic systems and the availability of mass market consumer software for page layout and composition has ushered in a new age aptly known as "desktop" publishing.

The falling cost of personal computers and their rapid adaptation by corporate America, along with software programs capable of "intelligent" typographic control and pagination have literally placed typesetting facilities in the hands of millions of workers. While technology has provided the capacity to quickly and easily manufacture more documents it has not, and cannot, replace the human discernment required for producing high-quality publications.

In many ways desktop publishing has created an acceptance of quality standards below that of traditional typesetting. Ease of operation and widespread access to digital type libraries has caused a proliferation of publications produced by users ignorant of the aesthetics of type and the art of typography.

Linotype Company, where the author is employed as Manager of Curriculum Development, in conjunction with Adobe Systems and Apple Computer Corporation, spawned the birth of the desktop publishing revolution in 1985. As a major corporate force within the typesetting market, Linotype is dedicated to the service, support, and training of our end user community and is actively seeking new ways to contribute to the widespread education of this rapidly growing industry.

The CAI tutorial on typesetting represents an attempt on the part of the designer to demonstrate: 1) new avenues of business diversification for Linotype Company; 2) the potential commercial viability of computer-based instruction as a vehicle for delivering vocational training, and; 3) new channels of product distribution.

Statement of the Problem

A thorough understanding of the effective use of type has, for the most part, an indeterminate time associated with it. Skill levels are commonly based on the individual facility of the operator and the extent of experience with the new technologies. Because of this intrinsic lack of knowledge and know-how corporations still commonly employ the use of commercial typographers if they want something done professionally.

The current level of familiarity with type and its effective use within the corporate marketplace is severely limited and hampered by inexperienced personnel who now have access to powerful new technologies. Most new users are ignorant of the fundamental principles, standards and procedures associated with the quality use of type. Without effective internal standards by which to gauge quality, numerous documents are produced which lack the aesthetic distinction characteristic of traditional typeset publications.

It is evident when reviewing the proliferation of publications by new users of desktop technologies that they lack a fundamental understanding of:

- the basic concepts and principles of traditional typesetting
- an understanding of typefaces, type styles and type family relationships
- how type size affects quality
- the rules regarding mixing typefaces and sizes
- the rules governing letter spacing and word spacing
- font size and leading relationships

In analyzing current methods of instruction relative to typesetting we recognize three main vehicles of educational delivery: 1) commercially sponsored seminars on specific applications software programs; 2) graphic communication courses at institutions of higher learning, and; 3) continuing education workshops. The aforementioned vehicles for learning commonly make use of information sources such as reference text-books and documentation manuals supplied with applications software; all three options are costly; and all require time "off the job." While some of the newer software packages come bundled with computerized self-paced training programs, these programs focus on the use of the applications packages themselves and not on the more generic issue of typesetting design. Graphic communication courses, on the other hand, focus on the training of individuals who have chosen to specialize in a particular field of study and thus have a limited scope of delivery.

Purpose of the Project

The purpose of this project is to enable new users of desktop publishing technologies to produce typseset documents which approach or match commercial quality standards. There are currently no commercially available computer-based curricula which focus specifically on the subject area of typesetting. The central need which this CAI course addresses is the demand for flexible, individualized and cost effective training programs which can be administered on-the-job and at the learner's own pace and schedule. The design and development of the tutorial is grounded on three primary assumptions which address the aforementioned problems:

- the main focus of the CAI course must be on enabling operators with non-specialized skills to effectively learn the fundamentals of typesetting.
- new desktop publishing personnel productivity can be dramatically increased, and learning curves reduced by a computerized self paced course that provides a clear understanding of the elements, principles, and language of typesetting.

- operators must know when, how, and why to utilize the tools which are available to them. This requires a clear understanding of the basic rules and concepts surrounding document production and familiarity with their use.

Definition of Terms

The following is a list of definitions provided to assist the reader in understanding the various technical and specialized terms which are used within the context of this document.

Andragogy: The field of education which concerns itself with the cognitive and behavioral characteristics of adult learning populations.

Application Program: Software that includes the instructions to a computer that solve a particular problem.

Authoring Language: A computer language used specifically for creating CAI courseware.

Branching: In computer-based learning, directing the learner to one of two or more paths through other material on the basis of replies to questions.

CAI: Abbreviation for Computer Assisted Instruction. The use of a computer to deliver instruction.

CBT: Abbreviation for Computer-based Training.

CMI: Abbreviation for Computer Managed Instruction. The aspect of computer-based training that includes testing, prescription generation and record keeping.

Courseware: Term used to describe those computer application programs, as well as other media such as texts and video, that support educational objectives.

Debugging: The process of identifying and removing errors from computer programs.

Frame: The amount of graphic and text material that appears on the viewing screen at any one time.

Operating System: Category of software that includes utility programs that automatically perform sequences of tasks which would be tedious for a human operator.

SME: Abbreviation for subject matter expert.

Tutorial: The most typical type of CAI. The program and the learner interact one-on-one.

User-Friendly: A desirable attribute for any computer system. Implies that the user need not be an expert merely to use the system and that mistakes are easily overcome or avoided by the system.

Variable: Term used in programming to refer to a particular symbol, such as a letter x, which may take on one value at one point in time and another values at a different point in time.

Assumptions

1. That the participants in the training program will consist of employees from Linotype Company and are representative of a standard cross-section of corporate users.

2. That the equipment used to carry out the training program will consist of Macintosh SE, SE/30, IIcx, or IIci personal computers.

3. That the training program will be conducted in a controlled classroom setting free from work distractions and require one hour to complete.

4. That familiarity with the language of typesetting and the available applications tools for composition will reduce learning curves, production costs, and the time associated with the generation of new documents.

Limitations

1. Program development was contingent on the ability to deliver the instruction in a format capable of being run on all installed Macintosh computer systems. As a result, development was limited to a program length which would not exceed the standard Macintosh dual density diskette size of 740K. This limitation restricted the use of sound, animation and more complex branching and remedial routines.

2. The use of a wide variety of type faces and fonts which may have better reinforced subject matter principles and concepts were limited by the need for "universal" end user access, i.e. the designer was limited to the standard core font package supplied by Apple with all Macintosh computers.

3. The development version of the authoring software did not permit initial conversion of program source code from Macintosh to MS DOS format, a perceived requirement for eventual mass market distribution. It is understood that this utility has become available at the time fo this writing and future plans include porting the program to the Windows 3.0 environment.

Methods and Procedures

The overall methodology utilized for development of the computer-based training program was based on Joint Services Model of instructional systems design (ISD) The model is based on the segmentation of the instructional process into five distinct categories including: analysis, design, development, implementation and evaluation, and are described below.

Analysis

In this stage of the project the designer conducted a needs assessment, curriculum review and a learning task analysis. The needs analysis segment consisted of:

1) consultation with industry analysts relative to the perceived short-comings of desktop publishing systems and identification of specific problem areas in need of resolution; 2) discussions with in-house technical staffs in identification of end user production concerns. and; 3) integration of field research and review of relevant industry publications. The curriculum review and learning task analysis included an identification of: 1) the student population for whom the course was intended; 2) the basic purposes and length of the course; 3) the terminal course objectives and specific competencies to be developed; 4) pre-requisite skill levels of the target population; 5) the major instructional areas, and; 6) the major activities required to complete specified job tasks.

Design

The design phase of the program consisted of an integrated process which specified the relationship between performance measures, learning objectives, test items and the plan for instruction. Performance objectives were broken down into the three constituent parts as defined by Mager (1984): *the behavior* which the learner is expected to demonstrate; *the conditions* under which the behavior will be performed and *the criteria* or standard of measuring achievement. Test items were then designed and correlated with the definition of performance and learning objectives

Development

The development phase of the project consisted of the specification of instructional events, the selection of educational methods and the creation of all educational materials. A detailed storyboard documenting screen design, course logic and the user interface was generated. Commercial authoring packages for the Macintosh computer were researched and *Authorware Professional* was selected. The authoring language was learned and the computer-based training program, including instructional sequences, pretests, embedded tests, automated performance reports, student and subject matter expert evaluation checklists and routines for records management, were generated. Several one-on-one and small group trials were conducted during program development and iterative revisions made to the program design as needed.

Implementation

Field trials were conducted during this stage and the designer collected relevant data from student participants. Automated record keeping facilities were employed and specific data was amassed relative to pre and post test scores and the length of time needed to complete the instruction. In addition, feedback and informal commentaries from participants as well as quantifiable results from the post-instructional student questionnaire were collected.

Evaluation

Formative evaluations were performed on several occasions during the development phase utilizing both one-on-one and small group trial methods. Only when the program was felt to have reached a stable revision state was a summative evaluation conducted. A statistical analysis of pre- and post test scores and the student questionnaire were performed to measure learning transfer and to provide guidance in the preparation of future courseware.

Summary

Advances in microcomputer-based technologies have placed typesetting tools in the hands of millions of America's corporate workers. The instructional unit "Typesetting—A Tutorial for the Desktop Publisher" is designed to address the need for a cost effective method of training new operators of desk top publishing systems in the fundamentals of typesetting and composition. The tutorial utilizes the vehicle of computer-based instruction to take advantage of the growing number of personal computers already installed within corporate America. With very little additional capital investment users will have access to dedicated software for skills development in the area of document design and production.

The authoring language chosen to develop the specific CAI lesson documented within the context of this report is *Authorware Professional* for the Macintosh. The project strategy is based on the ISD model of instructional development which is comprised of five steps including: analysis, design, development, implementation, and evaluation.

CHAPTER 2

ANALYSIS

Introduction

In the analysis phase of this project, the designer performed a comprehensive assessment of training needs within the corporate marketplace relative to the area of document design and production. The objective of the analysis was to identify the perceived "gap" between actual and ideal performance standards, and to verify current employee knowledge and skill sets (Laird, 1985). The designer performed an assessment of the target population; reviewed existing job tasks; and formulated the instructional goals required for a successful computer-based training program on typesetting.

Needs Analysis

The needs analysis for the instructional unit, "Typesetting—A Tutorial for the Desktop Publisher," was compiled by the designer from extensive on-the-job experience over the course of several years. The designer's extensive work background within the publishing field provided a deep appreciation and insight into the specific needs of desktop publishing personnel. During the course of the past ten years the designer has:

- worked in the field of publishing in the capacity of Product Manager and Market Manager of commercial publishing systems
- had extensive hands-on training in a variety of computerized typesetting a and composition products from leading vendors in the industry
- translated corporate user needs into detailed product requirement specifications
- participated in numerous target market research studies

- actively attended trade association and industry conferences relative to training needs within the graphic arts industry
- had privileged access to confidential market literature and industry consultant studies
- has interviewed and performed extensive on-site visits to both commercial and corporate clients

Through exposure to, and analysis of work samples from desktop publishing systems gathered over the years, the designer collected valuable data on the knowledge and skill levels of the target population. This information served to demonstrate and support the need for an instructional unit in the subject area.

Job Task Analysis

The designer researched the procedural aspects of document production; determined the sequence of related job tasks; and analyzed the required proficiencies necessary to effectively utilize desktop publishing tools. The analysis established the guidelines for subject matter sequencing and provided the cornerstone of the instructional content which would be included in the curricula.

Based on the tasks associated with document creation, it was determined that the instructional content must first explain the key terms, principles and concepts associated with document design and layout. The information covered in the training program would need to closely parallel the key activities entailed in print production. These activities included the specification of type parameters including: typeface; font; style; family; size; leading; measure, and; alignment. For additional information see the Instructional Task Analysis segment in Chapter 3.

Target Population Analysis

The instructional curricula, "Typesetting—A Tutorial for the Desktop Publisher," addresses a diverse audience comprised of adult learners from varying socioeconomic, religious, political and educational backgrounds. Within the context of the corporate environment, the subject area encompasses a range of activities including: authoring/word processing; design/page layout; and formatting /type speccing. Most of the aforementioned tasks have traditionally been distributed across several in-house departments, including editorial, design and production.

The integration of these tasks on a single workstation has created a new level of complexity. Extensive and powerful tools for typesetting and graphic design are now in the hands of workers ranging from secretaries to executive management. The operational task which these users currently face, is how to make the most effective use of the capabilities at their disposal.

Within the context of this eclectic population, learner characteristics were compiled from the following sources:

- reviewing existing job descriptions
- observing on-the-job performance behaviors
- identifying work task complexities
- examining functional and operational job characteristics
- identifying work tools and processes

The author reviewed the diverse array of job definitions within the corporate context. Inferences were made and conclusions reached regarding levels of operational and technological complexity associated with various job functions. Finally, a summary characterization was made which typified the target learning population:

- adult learners age 20-50
- educational backgrounds ranging from high school to post-graduate
- computer literacy level ranging from none to advanced
- average to above average intelligence
- capable of adequately following complex rules and instructions

- attentive to detail
- generally highly motivated
- uncertain relative to "artistic or design" ability
- appreciates diversity
- demonstrates a willingness to explore new or alternate approaches

Organizational Constraints

The proposed tutorial on typesetting was conceived of by the designer as a commercial product for mass market distribution. As the designer would be utilizing personal resources for design and development, there were no internal organizational constraints to contend with. However, in assessing viable options for end user program delivery, three key constraints had to be taken into consideration:

1. Equipment

The targeted delivery platform—the Apple Macintosh which has gained growing popularity among graphic art professionals, is outnumbered five to one by MS-DOS computers as the platform of choice within corporate America. Courseware development efforts, therefore, would have to take into account software development capabilities which would allow fast and easy porting between the Apple and DOS operating environments. This constraint would be a guiding factor in the ultimate selection of the authoring language used for program development.

2. Storage

In order to insure cross-machine compatibility within the Apple Macintosh product line the designer would be restricted to the use of double-sided, low density diskettes. These diskettes, holding approximately 740K of data, would inhibit the flexibility of program design—limiting graphic complexity, branching logic and remedial content.

3. Fonts

The third major constraint to contend with was font delivery—how to deliver the fonts utilized in program design, to a community of users with diverse font libraries? In order to address the problem, the designer would have little recourse but to utilize the Apple Core Fonts, which come packaged with all Macintosh computer systems. This solution, which would provide a standard and universal display medium for the Macintosh, would also limit the use of "illustrative" typefaces for enhancing program aesthetics.

Instructional Goal

Course Overview and Description

"Typesetting—A Tutorial for the Desktop Publisher" is a course of study designed to introduce the new user of desktop publishing technologies within the office environment to the basic terminology and principles of typesetting. The course aims at providing students with an understanding of the traditional language of type and developing familiarity with the rules of layout and design used in the production of standard document types. The full course of study is composed of three lesson areas which include: Lesson 1—"The Basic Terminology of Typesetting;" Lesson 2—"The Principles of Layout and Design," and; Lesson 3: "The Aesthetic Use of Type."

Instructional Goals

Students will:

- identify and define the basic terminology and syntax of typesetting, including type, typeface, font, typestyle, type family, contrast, units of measurement, justification and kerning.
- distinguish different typefaces, type families and typestyles
- define the basic guidelines of page layout and design

- interpret and apply type specifications for document production
- create a newsletter, report or manual demonstrating the effective use of type and the principles of graphic design

Major Tasks and Topics

1. Identify and define the concept of typeface, typestyle, and type family
2. Define the rules for use and mixing of typefaces and typesizes
3. Define guidelines governing the use of letterspacing, leading, and word spacing
4. Identify and define the methods of justification
5. Define the typographic characteristics of readability and legibility
6. Define the communication objectives of a selected print vehicle
7. Identify the principles for creating effective page layouts
8. Create typographic specifications for a newsletter, manual, and report
9. Create page layout grids and formats
10. Demonstrate the rules of effective layout

Media Requirements

The computer based training program will be developed on a Macintosh SE and utilize a variety of software packages including: *Authorware Professional*, *SuperPaint*, and *Exposure*. The program will be designed to fit on one 740K disc, which will run on all installed Macintosh computers which have at least one megabyte of RAM (Random Access Memory).

Expected Outcome Levels

Through the use of this tutorial learners will cultivate an understanding of composition which will facilitate improved publication design, reduce correction cycles and enhance delivery of written communication. Students will, in addition, learn how to best employ their publishing tools for developing more effective presentations.

It is intended that the knowledge which is gained through use of the instruction will assist students in learning the software application programs which they will utilize on the job. With the aid of this instruction, desktop publishing personnel should begin to produce documents, within a one-month time frame, that embody the correct use of typographic rules and standards. (Note: Industry estimates indicate that it currently takes new users of desktop technologies three months, or more, to gain a basic level of proficiency in the area of page layout and composition).

Literature, Existing Course and Material Review

The designer conducted an extensive review of literature in the field of typesetting and researched existing self-paced curricula and course materials. The research which was performed was conducted both, prior to and during, the designer's enrollment in New York Institute of Technology's Training and Learning Program. While voluminous literature is available on the subject of typesetting, there are very few self-paced courses of study and no computer assisted instructional resources available at the time of this writing.

Related Theory

As a result of the performance and target audience analysis which was conducted, it was decided that the instructional unit would have the most impact if it provided a learning context which was: 1) self-paced; 2) moved from the simple to the complex in logical, structured steps; 3) was "hands on" and provided individualized reinforcement; 4) was oriented to results which the student could measure; 5) provided ample opportunity for self evaluation; 6) utilized material which was representative of the actual work context, and; 7) provided the opportunity to demonstrate an individual approach to problem solving.

The paradigm which was selected for the overall curricula design was strongly influenced by Bloom (1956). Bloom characterized six major categories in the cognitive domain of learning including:

- Knowledge—Remembering previously learned material.
- Comprehension—Ability to grasp the meaning of material.
- Application—Ability to use learned material in new situations.
- Analysis—Facility at breaking down material into its component parts.
- Synthesis—Ability to put parts together to form a new whole.
- Evaluation—Ability to judge the value of material.

In Lesson 1 of the CAI—"The Basic Terminology of Typesetting," students are introduced to the syntax of typesetting along with illustrative examples of key principles, concepts and rules relative to document production. Students are provided with opportunity to assess their understanding and are tested on their ability to recall key definitions. Lesson 1 parallels the instructional objective of knowledge.

Lesson 2—"The Principles of Layout and Design," focuses on instructing the students in the meaning and use of the principles and rules which were learned in Lesson 1. Students are required to choose, select, analyze and predict the consequences of their choices in response to given conditions, and to discriminate between alternate options. Lesson 2 parallels the instructional objectives of comprehension and application.

In Lesson 3—"The Aesthetic Use of Type," students are assigned the task of identifying, selecting, composing, and designing representative documents, which reflect their understanding of the subject area. Assignments are given that require visual identification of document elements (Analysis); creation of a new document from scratch (Synthesis); and feedback and criticism of illustrative document samples which are provided within the tutorial (Evaluation).

Literature Review

The designer performed a review of literature related to both the media and subject matter of the proposed tutorial. Several institutional sources were utilized in collecting the information, including the Commack and New York Institute of Technology Libraries and the Linotype Marketing and Resource Center. Card catalog and on-line date base searches were conducted and a list of the most relevant reference sources compiled.

The literature on the subject of typesetting is extensive and hundreds of books and articles have been published on the topic. Resources which were perceived to have a significant correlation to the CAI tutorial are listed below.

Books

1) Biggs, J.R. (1965). *Basic Typography*. London: Faber and Faber Limited.

A handbook on the fundamental principles of typesetting, composition, and the aesthetics of type. The contents of this book are highly detailed and contain a lot of extraneous information relative to the history and evolution of typeface design.

2) Craig, J. (1976). *Phototypesetting—A Design Manual*. New York: Watson-Guptill.

An historical compendium on the evolution, use and application of typesetting technologies. This book, which is richly illustrated, is an excellent reference source on all aspects of the craft of typesetting. Detailed examples are provided, which serve to enhance the reader's understanding of the concepts and principles which are presented.

3) International Paper Company. (1989). ***Pocket Pal—A Graphic Arts Reproduction Handbook*** **(14th ed.). Memphis, TN.**

A comprehensive guide to the pre-press industry and all phase of graphics arts preparation and reproduction. This book is an excellent introductory guide to the methods and techniques of production used by graphic arts professionals. A broad overview of all phases of the industry are presented with special emphasis on the importance of type and composition in document preparation.

4) Linotype Ltd. (1985). ***Phototypesetting Terminology.*** **Middlesex, England: Author.**

A guide to the major terms and definitions used in the field of photo-typesetting. The book is a basic primer on the most commonly used syntax in composition with little or no detail on the applied aspects of type aesthetics.

5) Linotype Limited. (1988). ***A Practical Guide to Layout and Typography in Desktop Publishing.*** **Cheltenham, England: Author.**

A review of the applications of traditional typesetting and design concepts to the new technologies of desktop publishing. This handbook is an excellent compilation of hints and tips used by graphic designers in the creation of their published works. A practical, well written resource, as well as a valuable reference guide to the subject.

6) Linotype Company. (1990). ***How To Make Your Words Work—A Practical Guide to Layout and Design.*** **New York: Author.**

An applications handbook with illustrative examples on the principles and rules of layout and design for publishing. This book, while informative, is terse and at times difficult to understand. Much of the information is redundant and several important subject areas would have benefited from a more in-depth exploration.

7) PCW Communications. (1989). ***101 Best Desktop Publishing Tips.*** **San Francisco.**

A simplified reference source for new users of desktop publishing technologies on layout, design and the aesthetic use of type. This book, written for the layman, is oversimplified and often misleading. A number of quick and easy "formulas" are presented for enhancing document design. A cookbook approach to typography.

8) Romano, F. (1984). *The Type Encyclopedia*. New York: R.R. Bowker Company.

A work by one of the definitive authorities in the type field. Includes simplified and easily comprehended explanations on the concepts, principles and guidelines for the effective use of type. An excellent reference resource which conveys in everyday language the applications and rules for effective use of type.

9) Seybold, J. and Dressler, F. (1987). *Publishing from the Desktop*. New York: Bantam Books.

A major name in the publishing field, this book by Jonathan Seybold is a compact source manual covering all phases of Desktop Publishing, from front-end systems to imagesetting technologies. The content is diverse and provides little detailed information on effective methods of document design and production. Primarily an industry overview of the new technologies.

10) Typographers International Association. (1989). *Glossary of Typographic and Computer Terminology* (2nd ed.). Washington, D.C: Author.

A publication by one of the leading trade association groups in America. This book is an excellent reference source and illustrated dictionary of important terms and definitions related to typesetting and composition.

Articles

The author utilized three research sources for compiling related periodical information: the ABI/INFORM and INFOTRAC on-line data-base retrieval systems and the CIJE (Current Index to Journals in Education). A search was performed on a variety of key-word combinations including: CBT (1,700); Typesetting (267); Desktop Publishing (760) and Training (9,457). The numerals in parentheses are the number of references found within the database. In an attempt to zero-in on related articles of interest, the author segmented the database search by utilizing "and/or" operatives between several key-word items which provided a more targeted field for investigation. The key-words and the findings were as follows:

- Training and Typesetting (16)
- CBT or Computer Based Training and Typesetting (0)
- Graphic Arts and Training (13)
- Graphic Arts and CBT or Computer Based Training (0)
- Desktop Publishing and Training (65)
- Desktop Publishing and CBT or Computer Based Training (1)
- Graphic Arts and Instruction (1)
- Graphic Arts and Typesetting (27)
- CAI or Computer Assisted Instruction and Typesetting (0)

The author reviewed all listed abstracts, and the ten articles below were deemed to be supportive, timely, or relevant to project design and development.

1) Byers, S. (1989) Typography on the Desktop. *Electronic Publishing and Printing*, pp. 46-47.

Addresses the issues related to setting up and running an in-house typesetting and production facility. Identifies five essential parts which including: imaging devices; front ends; typographic software; font libraries; and, operator skills.

2) Endrijonas, J. (1989) Desktop Publishing Is No Job for the Amateur *Office*, pp. 87-88.

This article addresses the pressing need for training amongst users of desktop publishing technologies. Attention is focused on the need for special skills development in the area of document design and production.

3) Frichtl, Paul (1989) Desktop Dilemma: What's My Job, Anyway? *Folio: The Magazine for Magazine Management*, pp. 84-90.

Discusses the shifting roles and functions of personnel within the graphic arts industry. As more powerful tools, which allow inter-disciplinary control on a single workstation become available, the job distinctions between document design and production are becoming obscured.

4) Peterson, Debbie (1989) Forecast 90: What to Watch Out For. *American Printer*, pp. 35-39.

Results of a poll of industry experts are explored related to market trends in the graphic arts industry. Of the six top trends which will have the most effect on the industry in the coming decade, the shortage of skilled employees ranked very high.

5) Peterson, Debbie (1990) Help Wanted: Public Awareness of the Graphic Arts. *American Printer*, pp. 24-28.

Identifies the manpower shortage which will confront the graphic arts industry in the next several decades. Highlights the difficulty of training and re-training personnel in the face of rapidly changing and advancing technologies.

The following articles all deal with the critical nature of current training and skills development issues within the desktop publishing community:

6) Blackwell, Jerry (1988) Information Technology: Publisher's Choice. *Canadian Business*, pp. 137-148.

7) Bowman, Joel (1989) Desktop Publishing: Things Gutenberg Never Taught You. *Journal of Business Communication*, pp. 57-77.

8) Cavuoto, James (1988) Building an Integrated System: A Primer for Publishing Professionals. *Electronic Printing and Publishing*, pp. 52-56.

9) Sorensen, Karen (1990) Desktop Publishing Software. *Infoworld*, pp. 39-41.

10) Stang, David (1988) Bottom Line Desktop Publishing. *Business Software Review*,,pp. 50-59.

Survey of Existing Course and Materials

Since research uncovered no existing CAI or CBT courses on typesetting, the designer investigated commercially available self-paced training packages in related subject areas. Three packages, which utilized audio, print, and video media were found. The packages, which are described below, are evaluated on their instructional approach and their perceived effectiveness relative to the proposed CAI tutorial.

1) **Kiser, Wayne. (1987) *Introduction to Design for Desktop Publishing.* Glen Ellyn, IL: FlipTrack Learning Systems.**

Program Summary: This audio-based training program comes packaged with eight, two-hour cassette tapes and an illustrated study guide. Sixteen hours of instruction are presented which cover eight topical areas, broken down into distinct lesson areas. The lessons include: Design Basics; Using Type; Illustrations and Photographs; Newsletters; Manuals, Reports and Catalogs; Ads and Brochures; Magazines and Newspapers; and, Printing Considerations. Instructional segments are first presented on the tapes and the study guide is used to emphasize key points . After completion of each lesson of study, ten fill in the blank questions are presented to test student comprehension.

Program Evaluation: The instructional program is predominantly applications oriented—concentrating on the how's, do's and dont's related to publication of specific document types. The lesson on type and typography constitutes only a very small portion of the overall unit of study and information is presented in very terse segments. The overall course of study is well written and narrated, and the content is relevant to a variety of desktop publishing applications. However, the program attempts to cover a voluminous amount of information on a wide range of topics and thus lacks an in-depth focus on any specific subject area. Since the program is audio based, no opportunity for interaction or individualized instruction and remediation is possible. In addition, access and review of specific modules of study within a lesson are hampered by the serial format of the media.

2) **Romano, F. (1974). *Automated Typesetting—The Basic Course.* Salem, N.H: GAMA Communication.**

Program Summary: This seventy page book is little more than a written explanation of terms in a narrative format. Definition upon definition is given, and each explanation is followed by two fill in the blank questions, designed for simple user self-assessment. No attempt is made to emphasize competency-based learning or to measure learning progress. Written in 1974, the subject area content and presentation style are most relevant to the technological antecedent's of today's advanced publishing systems.

Program Evaluation: The program is organized alphabetically by individual term and does not follow a logical or instructional task-based grouping of any kind. Student's are left to their own devices to sort out how principles, concepts, rules and definitions inter-relate and might be applied in a live production context. While the format is serial-based, it is relatively easy for students to utilize the table-of-contents or cross-reference index to review materials at a glance. As a paper-based medium the program lacks interactivity, remediation facilities, or the ability to measure and guide students according to their own individual pace and performance.

3) Transoft, Inc. (1988) *The Macintosh Video Guide.* Santa Barbara, CA.

Program Summary: This video-based curriculum deals predominantly with the use and operation of the Macintosh computer. The course is designed for the new user of desktop publishing technologies and is geared to getting operators up and running in the shortest possible time frame. The content is "no-nonsense," focusing on a logical development of the procedures and information required by student's to get started in using their Macintosh system. Program content adheres strictly to the course outline described in the introductory sequence. While some references are made to font access, no instruction is given relative to type application or use.

Program Evaluation: Video-based training as a medium of instructional delivery is serially oriented, making it extremely difficult for students to review specific segments of instruction. Content areas move quickly by and there is no opportunity for individualized pacing or branching and little opportunity for evaluation or remediation. The training program is appropriate as a supplemental reference and informational source but is considered unsuitable as the main vehicle for instructional delivery.

Plan for Design and Development Effort

Estimated Student Effort

Total student effort including subject matter content, embedded tests and remediation/review is estimated at 60-90 minutes. The instructional segment which is the focus of this project is Lesson 1—"The Basic Terminology of Typesetting". The lesson is composed of nine separate modules which cover key topical categories related to the fundamentals of typesetting. The estimated student effort will range between 35 and 45 minutes for completion of all subject matter content with an expected time of between 3 to 15 minutes per module, based on content complexity.

Project Plan

The Gantt chart method of project management was utilized during the course of this project to assist the designer in charting milestones and critical deadlines. The methodology provided a convenient vehicle by which to minimize project delays and schedule conflicts and to maximize available time for program deliverables. See Appendix A—"Project Plans" for the Gantt chart.

Upon completion of the analysis phase of the project, the designer segmented the tasks remaining into the ISD Model. Instructional program deliverables were identified according to the subsequent stages of design, development, implementation and evaluation and included the following:

Design

-Perform Instructional Task Analysis
-Identify Instructional Objectives
-Identify Pre-Requisite Skills

-Group and Sequence Objectives

-Define Learning Activities

-Define Evaluation Methodology

Development

-Identify Learning Activity Development Scheme

-Perform Learning Activity Development

-Design and Create Course Storyboard

-Develop Materials for Formative Evaluation

Implementation

-Reproduce Materials for Implementation

-Deliver Instruction and Beta Test Course

-Collect Data

Evaluation

-Perform Formative Evaluation

-Revise Instructional Matter

-Perform Summative Evaluation

Budget

An analysis was conducted relative to the projected costs of the CAI project. An itemized breakdown was generated which included cost estimates for start-up, designer labor, subject matter experts, participant salaries, equipment and software investment and materials. The project cost estimate was partitioned according to the phases of the instructional system design model. Recurring costs for the project include amortized equipment expenses and participant salary expenses. Labor cost were calculated at the rate of thirty-dollars per man-hour. See Table 1 for project cost estimates.

Table 1

PROJECT COST

Expense	Designer Hours	Other Hours	Cost	Subtotal	Total
Analysis	100	0	$3,000		
Design	75	5	2,400		
Development	300	15	9,450		
Implementation	30	35	1,950		
Evaluation	15	15	900		
Total Labor				$17,700	
Materials					
Computer Supplies			$6,300		
Software			$1,700		
Student Materials			240		
Duplication			50		
Total Materials				$8,290	
Grand Total					$25,990

Summary

The designer performed a job task analysis and an analysis of the target audience. Based on results of this research, instructional goals for the proposed tutorial were created. A review of existing literature and related course offerings were conducted on the topics of CBT, desktop publishing and typesetting, and the results summarized.

In addition, the designer performed an assessment of instructional and learning theories which were considered of direct relevance to program design. An estimate was made regarding projected student efforts and the length of time that would be required to complete the selected lesson of study. A summary was made of the proposed project plan, based on the phases of ISD development. The needs analysis was concluded with a budgetary estimate of projected costs.

CHAPTER 3

DESIGN

Introduction

The design phase of this project consisted of an instructional task analysis; the formulation of instructional objectives; the definition of entry level behaviors and; the grouping and sequencing of objectives. In addition, the designer performed a specification of learning activities; defined the assessment, evaluation and learning transfer system to be be utilized and; reviewed existing instructional materials as to relevance and applicability to the CAI project.

Instructional Task Analysis

The instructional goal and the domain of learning for the project (cognitive) were both determined in the analysis stage. The designer performed an instructional task analysis to determine the topical and content areas that end users of desktop publishing systems would need to cover in order to realize the instructional goal. In addition, sub-tasks associated with each major topical area were identified and prioritized relative to their perceived degree of importance. The major tasks and sub-tasks for Lesson 1 are listed below.

Lesson 1: The Basic Terminology of Typesetting
Task: Specify Document Type Parameters

Sub Task	1.0	Identify the Major Components of Type
Sub Task	2.0	Identify What a Typeface Is
Sub Task	3.0	Identify What a Font Is
Sub Task	4.0	Identify What Typestyle Variables Are
Sub Task	5.0	Identify What a Type Family Is
Sub Task	6.0	Identify What Typographic Units of Measure Are
Sub Task	7.0	Identify What Contrast Variables Are

Sub Task	8.0	Identify Methods of Justification
Sub Task	9.0	Identify What Kerning Is

Lesson 2 is not the subject of this project. However, the tasks for this lesson are presented here for reference.

Lesson 2: The Principles of Layout and Design
Task: Specify Document Design Parameters

Sub Task	1.0	Identify Target Audience Characteristics
Sub Task	2.0	Define Communication Objectives of the Print Vehicle
Sub Task	3.0	Specify Layout Grids
Sub Task	4.0	Select Illustrations and Photographs
Sub Task	5.0	Create Page Design Formats
Sub Task	6.0	Edit and Place Graphics
Sub Task	7.0	Assign Copy and Text Specifications to Layout
Sub Task	8.0	Revise Page Content

Instructional Objectives

The instructional objectives that were used to determine the anticipated outcome of the instruction were defined in the format prescribed by Mager. It was suggested by Mager (1985) that each instructional objective be defined in terms of identifiable and measurable behaviors and should include: the conditions under which an activity is performed; the visible behaviors associated with performance of the activity; and, the criteria or standard by which to measure performance success.

In the instructional analysis phase of the project, the designer classified content according to verbal information clusters and specified instructional objectives related to specific sub-tasks. Listed below is a summary of the overall instructional objectives for Lesson 1 of the project.

1.0 Given a list of definitions the student will identify the nine components of type. The identification will include the correct definition of the nine elements of type including: lowercase characters, uppercase characters, baseline, x-height, ascender, descender, counter, serif and sans serif.

2.0 Given a definition of typeface the student will name the term. The interpretation will include the correct definition of typeface components including shape, ascender length, x-height size and serifs.

3.0 Given a definition of font the student will name the term. The interpretation will include the correct definition of character set, text type and display type.

4.0 Given an illustration of typestyle variables the student will name and define the objects illustrated. The interpretation will include the correct definition of roman, italic, small caps, light face, semi-bold, bold, extra bold, condensed, extended, light condensed, semi-bold condensed, oblique, expanded and demi-bold.

5.0 Given a definition of a type family and a set of alternative samples the student will name the term. The identification will include a listing of four representative type family names.

6.0 Given an illustration of typographic units of measurement the student will name and define the objects illustrated. The interpretation will include the correct definition of points, picas, units, body size, line spacing, leading, set solid, set width, measure, em space, unit system, unit value, letterspace, normal, loose, tight and very tight.

7.0 Given an illustration of contrast variables the student will name the objects illustrated. The interpretation will include the correct definition of size, weight, width, form, structure, posture and placement.

8.0 Given an illustration of the methods of justification the student will name the objects illustrated. The interpretation will include the correct definition of word space, ragged right, ragged left, centered and justified.

9.0 Given a definition of kerning the student will name the term. The interpretation will include the correct identification of negative letterspacing.

Establishment of Required Entry Behaviors

The identification of entry level behaviors is a significant part of the instructional design process. The designer analyzed the target population in terms of prerequisite skills and affective performance indicators and isolated the general entry behaviors which would yield the most effective learning results. The identified skill and performance indicators include:

Skills and Background

- High school graduate with at least a 10th grade reading level.
- Basic level of computer literacy on the Macintosh (>40 hours).
- Awareness of office documentation types (i.e. reports, manuals etc.).
- Member of corporate employee population.

Affective Performance Indicators

- Accepts the critical evaluation of peers.
- Explores alternate work methods.
- Demonstrates an independent approach to problem solving.
- Performs self-criticism and objective review of work.

Group and Sequence Objectives

In identifying the instructional sub-tasks for achievement of the instructional goals, the designer grouped and sequenced objectives according to rational criteria which were identified by analysis of the document production process. A decision was reached whereby members of the target population would build their knowledge and skill sets by moving from a comprehension of basic terminology (a cognitive emphasis) to the actual design and production of a document (psychomotor). The learning would take place in simple, discrete steps and move from the simple to the complex—gradually introducing learners to more sophisticated applications of their knowledge. In order to best achieve the instructional goals, the following sequence and performance-based model was used for structuring subject matter content for Task 1. The detail for all tasks is shown in Appendix B—"Task Analysis."

1. Identify and Define the Components of Type Including:
    - 1.1 Lowercase Characters
    - 1.2 Uppercase Characters
    - 1.3 Baseline
    - 1.4 X-Height
    - 1.5 Ascender
    - 1.6 Descender
    - 1.7 Counter
    - 1.8 Serif
    - 1.9 Sans Serif

Learning Activities Specification

The specification for learning activities was developed according to the defined instructional objectives. See Table 2 for the learning activity instructional strategy matrix which identifies corresponding content areas, instructional methods and media selection relative to each learning activity.

Table 2

Learning Activity Instructional Strategy Matrix

Learning Activity	Content	Instructional Method	Media
1.1-1.9	Definition of Type	Programmed/Self-paced	Computer
2.1-2.4	Definition of Typeface	Programmed/Self-paced	Computer
3.1-3.3	Definition of a Font	Programmed/Self-paced	Computer
4.1-4.14	Definition of a Typestyle	Programmed/Self-paced	Computer
5.1	Definition of a Type Famly	Programmed/Self-paced	Computer
6.1-6.17	Definition of Type Measure	Programmed/Self-paced	Computer
7.1-7.7	Definition of Contrast	Programmed/Self-paced	Computer
8.1-8.5	Definition of Justification	Programmed/Self-paced	Computer
9.1	Definition of Kerning	Programmed/Self-paced	Computer

Assessment System Specification

"Typesetting—A Tutorial for the Desktop Publisher" is a self-paced CAI curriculum intended for commercial distribution. The product is designed for an adult audience and embedded tests will be used primarily as a mechanism for learner self-assessment and evaluation, and not as vehicle for standardized measurement within the context of a larger learner population.

In order to measure the efficacy of the instructional materials, the designer planned to measure learning during the formative stages of program development through the use of a pre-test and embedded tests. The pre-test and embedded tests will consist of four separate quizzes which map to selected instructional clusters.

The learning assessment instruments were to be administered prior to instruction in the case of the pre-test and during actual instructional activities in the case of the embedded tests. Scores from both assessment instruments were to be recorded and compared for statistical evidence of learning and analyzed relative to suggested changes and modifications that would improve program effectiveness.

Scoring for the pre-test and embedded test were to be based upon the combined average of individual quizzes. A combined score of 85 percent was to be required to satisfy the standard which has been set for mastery of the subject matter. The pre-test was to be utilized for screening members of the target population who may "pass-out" of one or more subject matter modules prior to engaging in formal training. The embedded tests were to be used to verify learner comprehension of the fundamental terms, principles and concepts of typesetting.

Automated computer-based performance reports were to be generated upon completion of the entire pre-test and after each embedded test, and learners were to be informed of the need for review in specific subject areas based on their failure to achieve a mastery rating. It was assumed that most learners will score poorly on the pre-test, which will thus serve as a cue to guide learners to specific subject areas during the actual instruction.

Within the context of the CAI tutorial, learners were to be allowed multiple attempts at achieving a mastery rating, whereas on the pre-test only one pass-through was to be permitted. Although a post learning reaction questionnaire will be developed for administration during trial implementation, this instrument was likely to take the form of an end-user feedback survey upon commercial product distribution.

Evaluation System Specification

The designer intended to conduct both a formative and summative evaluation relative to the proposed unit of study. Formative evaluations were to be performed primarily during the development and early implementation phases of the computer-based training program. Feedback from personal observation and from diverse external sources were to be analyzed and factored into any modifications and design revisions which were required to improve program content and efficiency.

Summative evaluations of the program were to be conducted during and after the implementation phase of the project, with the intent of measuring the perceived value and effectiveness of the instructional materials in the transfer of learning. The learning behaviors, results, and impact of the CAI will be analyzed and assumptions projected forward relative to future learning standards.

Formative Evaluation

The formative evaluation was to use a variety of customized evaluation tools and instruments and be performed in two phases. Phase one was to consist of one-on-one trials conducted with a number of select individuals of diverse professional backgrounds from the target population. Phase 2 was to be comprised of small group trials which would be implemented within the context of a classroom setting. The results of these trials would provide the framework and content for revisions and changes to the computer-based training program.

Summative Evaluation

The summative evaluation was to utilize the model designed by Kirkpatrick (1987) which consists of four levels including: reaction, learning, behavior and results/impact. While the summative evaluation was to be conducted during and after program implementation, organizational constraints might prohibit an in-depth assessment of the impact phase of evaluation. The designer thus planned to utilize available feedback and personal observation to project forward perceived organizational benefits.

In the reaction phase, the designer planned to evaluate participant feedback through the use of a post learning questionnaire, dialogue with learners, and direct observation. The learning phase will be evaluated through a statistical analysis of scores on the pre and post instructional testing instruments. The behavior phase will utilize discussion and observation as primary vehicles for evaluation.

Learning Transfer System Specification

According to Broad (1988), the transfer of training requires active participation by the trainee, the trainer, and supervisory personnel. In the ideal model, multiple methodologies are used to assist the transfer of learning—each individual involved in the process is required to perform specific actions which will lead to learning reinforcement.

The design of the CAI tutorial on typesetting is based on an in-depth task analysis and research performed in the area document production. Tutorial subject matter was developed based on the relevance of lesson content to the full spectrum of desktop publishing applications used in the corporate environment. The tutorial design is self-reinforcing and the transfer of learning implicit in the use of the software application tools used in the production of corporate documentation.

Despite the direct relevance of instructional content to on-the-job performance needs, there are specific guidelines for action which will support and further ensure transfer of training. It is recommended that the following actions be performed by supervisory personnel according to Broad's (1988) model:

- actively participate in the training program
- provide employee's ample opportunity to develop and apply skills
- acknowledge employee initiative and desire for quality
- observe post training performance and provide feedback on quality improvements
- have employees actively participate in work-related decisions regarding document design and production
- offer incentives to individuals who have significantly increased productivity

Review and Selection of Existing Materials

While many of the existing materials identified in the analysis phase were relevant, none were deemed suitable for inclusion in this project. Detailed information was obtained from a variety of sources and its use restricted to the development of subject matter content only.

Summary

The designer performed an instructional task analysis, identified and grouped instructional objectives and defined entry level behaviors. In addition, learning activities were identified, a review of existing materials conducted and specifications developed for assessment, evaluation, and learning transfer.

CHAPTER 4

DEVELOPMENT

Introduction

The development of this CAI project was composed of a number of distinct stages which included the specification of instructional events; the development of educational materials; the selection of educational methods; the development of lesson plans and a preliminary program try out. This chapter will discuss the development process in some detail and identify the components and factors which played a role in the final decision relative to course partitioning, sequencing, and content development.

Learning Activity Development Scheme

Typesetting-A Tutorial for the Desktop Publisher is a curriculum which is composed of three units of study: 1) "The Basic Terminology of Typesetting"; 2) "The Principles of Layout and Design", and; 3) "The Aesthetic Use of Type". The development focus has been placed upon the first of the three units of study, namely, "The Basic Terminology", in order to test commercial viability and market receptivity prior to commencing full curriculum implementation.

As a result of the general learner analysis which was conducted, the learning activities for this instructional unit were planned to provide a context for adult learners which had the following characteristics: 1) self-paced; 2) moved from the simple to the complex in logical, structured steps; 3) was "hands on" and provided individualized reinforcement; 4) was oriented to results which the student could demonstrate; 5) provided ample opportunity for self evaluation, and; 6) utilized material which was representative of the actual work context.

The actual CAI development scheme utilized the eight step model of Alessi and Trollip (1985) for developing computer-based instruction. The steps included: 1) a definition of the instructional purpose; 2) the collection of resource materials; 3) the generation of lesson ideas; 4) the organization of ideas into a lesson plan; 5) the production of lesson layouts on paper; 6) a flowchart of the lesson sequence; 7) the programming of the lesson, and; 8) a preliminary evaluation of the quality and effectiveness of the lesson. In addition, the principles of adragogic learning theory espoused by Malcolm Knowles (1983) were influential in structuring the tutorial as were the principles of LCI (Learner Controlled Instruction).

The area of display production (the actual design and creation of the computer screens) constituted a major development task and utilized supplemental guidelines to manage the process: 1) writing and revising the primary text; 2) writing and revising the secondary text; 3) production of the storyboards; 4) verification of overlaying displays; 5) creation and revision of graphic displays; 6) checking graphics and text for fit; 7) assembling the storyboards; 8) reviewing the storyboard assembly; 9) review of the storyboard assembly by others, and; 10) making revisions.

Learning Activity Development

The conceptual development of learning activities for the CAI were influenced by the nine events of instruction detailed by Gagne, Wagner, and Rojas (1981): 1) Alertness, 2) Expectancy, 3) Retrieval to working memory, 4) Selective perception, 5) Semantic encoding, 6) Retrieval and responding, 7) Reinforcement, 8) Assessing performance, and 9) Generalizing.

1. Alertness: Initial attention was stimulated by the use of sound and animation. Ongoing interest was sustained by required user interactions and the selective

use of graphics, illustrations and display sequences developed according to the principles of design, balance, and rhythm common to the visual arts.

2. Expectancy: Introductory sequences which identified curriculum and course objectives were utilized to activate motivation and prepare students for the lesson content which followed.

3. Retrieval to Working Memory: Subject matter areas were logically segmented and screen syntax carefully chosen to present information in a clear and concise fashion. Tutorial content gradually moves from the simple to the complex and builds on concepts and principles previously presented, thus stimulating the recall of prior learning experience.

4. Selective Perception: The designer programmed the lesson in a way which would allow user controlled sequencing and movement at the student's own pace. In addition, information is presented in small, logical blocks which provides the learner with a conceptual foundation on which to build as the tutorial progresses.

5. Semantic Encoding: All information within the lesson is supported by both verbal definitions and illustrative examples of the subject matter under discussion. Learner guidance is also provided in the test sequences which provide feedback on correct and incorrect responses and remediation through display of correct answers.

6. Retrieval and Responding: Optional tests are integrated and linked to specific modules of study providing learners with the tools for eliciting performance upon completion of each instructional sequence.

7. Reinforcement: Feedback and remediation are given to the learner during each test segment. Each question has a tries-limit associated with it which is utilized as a methodology for reinforcement and as a vehicle for motivation.

8. Assessing Performance: Learner performance is assessed by means of an automatic performance report which is generated at the completion of each test.

Scores of 85 percent or greater result in the assignment of mastery, scores of less than 85 percent indicate a negative assignment in the mastery category.

9. Generalizing: The retention and transfer of learning which is supported through the use of optional tests in Lesson 1 receives more practical examination in Lesson 2 where students are required to demonstrate a practical application and understanding of their newly acquired knowledge.

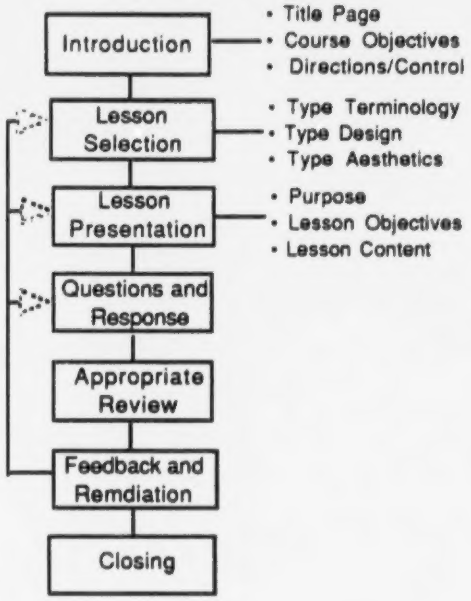
Following development of the conceptual model, learning activities and materials for "The Basic Terminology" were grouped into seven developmental segments: 1) identification of instructional objectives; 2) development of the course flow diagram; 3) scripting and generation of the course storyboard; 4) selection of the appropriate authoring language; 5) development of the user interface design; 6) generation of the programming code, and; 7) design and layout of the final screen displays. Each developmental stage posed unique challenges and helped refine both the form and content of the resulting instructional unit.

Identification of Instructional Goal: The instructional goal of the unit of study "The Basic Terminology of Typesetting" is to introduce students to the language and principles of composition. The unit provides students with the ability to identify and define the most commonly used terms in typesetting, including type, typeface, font, typestyle, type family, units of measurement, contrast, justification, and kerning. After completing the lesson, the student will have gained an understanding of:

- the building blocks which are used in creating typeset publications
- the variables involved in producing commercial quality documents
- the specific units of measurement unique to the typesetting world
- the relationship between type size and line spacing
- the diversity of manufactured typestyles
- letter spacing and word spacing values

The Flow Diagram: The course flow diagram (see Figure 1) provided the overall blueprint for learning materials organization as well as the logic flow for subject matter access, presentation and testing.

Figure 1 **Course Flow Diagram**


Introduction
• Title Page
• Course Objectives
• Directions/Control
Lesson Selection
• Type Terminology
• Type Design
• Type Aesthetics
Lesson Presentation
• Purpose
• Lesson Objectives
• Lesson Content
Questions and Response
Appropriate Review
Feedback and Remdiation
Closing

Scripting and Storyboard Design

The script and storyboard consisted of: 1) initial organization of the subject matter (text and graphics) into a modular format; 2) preliminary layout and aesthetic design of each screen; 3) the user navigation architecture and menu sequencing plan; 4) method of access to and content of the on-line user help aid; 5) preliminary test item content and interaction structure; 6) reinforcement and error messaging schematic; 7) screen identification scheme; 8) student indexing plan, and; 9) programming instructions.

Preliminary screen displays depicting text and graphic content for the courseware were developed utilizing a combination of drawing and slide generation programs available for the Macintosh computer. This choice of digital media, as opposed

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to the traditional paper-based storyboard format, provided the designer with immediate feedback relative to the look and feel of the actual screen displays and dramatically reduced subsequent development times. The completed storyboard adequately portrayed the content and structure of of the CAI tutorial and provided programming cues relative to feedback, branching, reinforcement and learner evaluation. Scripted slides were collectively generated in hard copy format utilizing a laser output device allowing sequential logic and process flow to be independently evaluated. See Appendix F—"Original Storyboard Design."

Scripting of the courseware followed a production process which included: authoring and revising text content, drawing and revising graphic content, designing screen layouts for consistency, merging display content, revising composition and message sequences, and reviewing total storyboard assemblies. Third party feedback was elicited in order to verify the completeness and accuracy of the information, that instructional objectives were adequately met and that procedures, principles, concepts, and feedback were clearly presented.

Selection of Authoring Language: Selection of the development language was largely determined by the need for a development system which would provide cross platform compatibility between the Macintosh and MS-DOS operating environments. Initial delivery of the CAI courseware targeted the Apple Macintosh user environment and its selection was based on a number of key factors: 1) its standard graphic and mouse driven user interface; 2) medium resolution black and white bit mapped display 3) overall ease of use and rapid start up times; 4) the potential for linking tutorial segments directly to page makeup applications, and; 5) the rapid growth of the Macintosh as the platform of choice among designers, layout personnel, and production typesetters within corporate graphic arts facilities.

After review of existing authoring languages for the Macintosh platform it was determined that Authorware Professional™ best met the needs of the designer. In addition to the built-in utilities for Macintosh to DOS conversion and a parallel development environment under Windows 3.0 which were key deciding factors. Authorware Professional had a built-in graphics and text editor, was capable of importing graphics in both object oriented and bit-mapped formats and provided a robust set of sub-routines, functions and variables for interaction, development, feedback, special effects, testing, and management.

User Interface: The user interface for "The Basic Terminology of Typesetting" is composed exclusively of pull-down menus which exemplify the Apple Macintosh operating environment. The pull-down menu structure, in addition, provided the most efficient way of allowing free access at any time to all learning, remedial, test and help screens and supported the original concept of learner controlled instruction. The user interface is composed of six pull-down menus which appear at the top of display window, including:

FILE- includes two sub-menus (*Re-Start* and *Quit*) which allows the user to start the tutorial over from the beginning or Exit the application.

INTRODUCTION-includes two sub-menus (*Course Overview* and *Using the Tutorial*) which provides an introduction to learning goals and operational instructions on how to use the CAI program.

SELECT TOPIC-comprises the actual subject matter of the tutorial and consists of ten sub-menus: Module 1: *Type; Type Review;* Module 2: *Typeface;* Module 3: *Font;* Module 4: *Typestyle;* Module 5: *Type Family;* Module 6: *Units of Measurement;* Module 7: *Contrast;* Module 8: *Justification* and Module 9: *Kerning.* Each module: 1) defines the terminology and conceptual framework of the subject area under discussion 2) demonstrates the specific relevance of the concept to document production and 3) visually illustrates or provides a demonstration on the practical use and application of the concept or term under study.

The content areas of the nine formal study modules include:

Module 1- Type: lowercase characters, uppercase characters, baseline, height, ascender, descender, counter, serif and sans serif.

Module 2- Typeface: shape, length of ascenders, size of x-height.

Module 3- Font: character sets, text type, display type.

Module 4- Typestyle: roman, italic, small caps, light face, semi-bold, bold, extra bold, condensed, extended, light condensed, semi-bold condensed, oblique, expanded and demi-bold.

Module 5- Type Family: Times, Helvetica, Geneva, Chicago.

Module 6- Units of Measurement: points, picas, units, body size, line spacing, leading, set solid, set width, measure, em space, units system, unit value, letter spacing, normal, loose, tight, very tight.

Module 7- Contrast: size, weight, width, form, structure, posture, placement.

Module 8- Justification: word space, ragged right, ragged left, centered, justified.

Module 9- Kerning: negative letter spacing.

QUIZ-includes two sub menus (*Take Quiz* and *Performance Report)* which provides students with optional access to four separate quizzes covering Modules 1-9 as well as to single or group quiz scores.

HELP-includes one sub menu (*QuickView)* which illustrates the contents of all pull down menus as well as the optional keyboard command entries for directly accessing the sub-menus. Note: the optional keyboard commands are also illustrated as part of all pull down menus.

QUICKCOURSE-is composed of one sub menu (*Index of Key Terms)* which provides users with an alternate route of learning. By freely selecting from the index list users are presented with a condensed definition and illustration of important terms which are contained within the formal lesson.

Programming Code: Upon order and receipt of the authoring package the designer spent several months of applied study in mastering the basic tools available and proceeded to translate the script and storyboard into a working CAI program. The actual programming effort required three times the initial time estimates due to the product learning curve which had not been factored into the original project design. See Appendix C for sample extracts of the higher level Program Code for the user interface and quiz sequences. A complete copy of the CAI program is on file at the Department of Instructional Technology, New York Institute of Technology.

During the programming phase of the project an alternate approach to the user interface design became apparent. The original icon-based menu structures which were utilized during the storyboard phase were converted into pull down menus because they provided more freedom of access, were text based and therefore literal (less need for user retention of icon meanings) and adhered more closely to Macintosh delivery conventions. In addition, some of the original concepts for testing and remediation were altered due to the perceived programming complexity involved. Program length and partitioning were also influenced by the need to deliver the CAI program on single dual density floppy diskette which could be used on a diversity of installed Macintosh platforms.

Screen Displays: The generation of the final screen displays provided one of the most formidable challenges of the entire CAI project. Approximately 50 percent of program development time was spent on the aesthetic composition of the individual displays. Appropriate identification of fonts, typefaces, and graphic elements as well as concerns over screen elements, design balance, text content, readability, clarity, and delivery platform characteristics were all crucial factors in determining final display content. The choice of fonts, for instance, was limited to those supplied as part of the Apple operating system, in order to fill the need for universal text face recognition and consistent display on diverse Macintosh platforms.

Learning Activity Review

Upon completion of the programmed instruction, extensive review of the learning activities and materials was conducted to assess: 1) subject matter accuracy, program logic and consistency; 2) the mechanics of the user interface, and; 3) typographic content including the aspects of grammar, style, punctuation, spelling, legibility, and readability.

Formal program review involved the participation of: 1) an independent industry consultant in the graphic arts field, and; 2) subject matter experts from Linotype Company—a leading publishing systems vendor. The industry consultant and subject matter experts from Linotype Company (consisting of a Client Education Curriculum Developer and Product Specialist from the Type Products Division) were utilized to validate subject matter content, the scope of topical coverage and overall accuracy of the information.

Materials for Evaluation Produced

Formative Evaluation Approach: Computer assisted instruction as a vehicle of instructional delivery depends on a number of critical factors for the achievement of specified learning goals. In selecting CAI as an educational strategy it was found that development and implementation benefited greatly from a stringent set of criteria for gauging program adequacy. In an attempt to assess instructional and operational effectiveness a number of tools were produced for conducting both formative and summative evaluations.

Student Pre-Test: A computer-based student pre-test was developed and three copies made for distribution to members of the target learning population. The floppy disc based program, (which included a run time version of Authorware Professional and packaged fonts) was designed to automatically score, evaluate and generate individual student performance reports to a separate file on the pre-test disc for importation into spreadsheet or word processing programs for future data analysis. The computerized Student Pre-Test is also on file at the department of Instructional Technology, New York Institute of Technology.

Embedded Post Tests: Within the context of the CAI lesson, four Criterion Referenced Quizzes covering the same content as the Student Pre-Test were developed as a baseline mechanism for collecting post training performance data. The quizzes consist of forty-five fill in the blank and matching questions and while designed primarily to reinforce learning, were also utilized to assess comprehension and retention of the principles, concepts and terminology covered in the tutorial. The program provides automatically generated performance reports to support remediation and subject review by the target learner population. See Appendix D for Criterion Referenced Quiz Sample.

Student Assessment Form: The Student Assessment form was employed to measure participant reaction in the areas of clarity, design, material organization, coverage of the subject, relevance, and methodology for testing. Fourteen copies of the student assessment form were made for distribution to the target population. See Appendix E—"Evaluation Instruments" for a copy of the Student Assessment Form which was used.

Additional Data Gathering Tools: A second series of instruments used for conducting one-on-one formative evaluations consisted of CAI evaluation checklists designed to measure courseware adequacy along a matrix of four key determinants. The instruments which were used may be found in Appendix E: Evaluation Instruments, and consisted of itemized checklists covering the areas of: Instructional Evaluation, Cosmetic Evaluation, Program Evaluation, and Curriculum Evaluation. Within the context of these four major groupings relevant responses in the areas of program design, procedures, appearance, efficiency, and clarity were recorded. Two copies of these forms were produced for use by subject matter experts who participated in the learning activities review sessions.

All questionnaires and checklists utilized a five step ranking scale which included the following categories:

- *Very Poor:* Feature or attribute is deficient throughout the lesson or in a single required component.
- *Below Average:* Feature or attribute demonstrates a marginal compliance with the expected ideal. Could be accepted if other lesson features are especially positive.
- *Average:* Feature or attribute met the basic expectation for well designed software but is not particularly unique or distinguished.
- *Above Average:* Demonstrates unusual methods or capacities to provide the needed focus.
- *Very Good:* Attributes or features which reflect rare procedural, strategic or presentation elements that are markedly better than alternatives.

Summary

In this chapter an attempt was made to provide an overview of the methodology which was used in developing the CAI tutorial entitled "The Basic Terminology of Typesetting". The reader was presented with:

1) a detailed account of the learning development scheme which was structured around the eight step model of Alessi and Trollip and the nine events of instruction identified by Robert Gagne

2) the logical segmentation and method of sequencing tasks which the designer used in selecting and developing the materials of instruction

3) an in-depth explanation of learning material content and structure and the rationale behind the selection of methods and media

4) the approach to and identification of resources related to program review and revision

5) a definition of formative and summative evaluation strategies including a detailed description of the tools and instruments which were used

CHAPTER 5

IMPLEMENTATION

Introduction

During the implementation phase of this project the CAI program and run-time version of the software were reproduced and packaged for delivery to members of the target population and for review by commercial software distributors. The instructional unit was presented to selected individuals from the target population, critical observations were made, and data in the form of test scores, rating checklists, and participant feedback were collected for the summative evaluation. Data was also collected relative to the amount of time spent by members of the target population on the lesson.

Materials for Implementation Reproduced

Two sets each of the pre-test and CAI source code were made for security and backup purposes. From the original source code for the CAI and pre-test, student versions of the program were reproduced along with a separate diskette containing the run-time software for Authorware Professional and the Apple system fonts. In addition, fourteen diskettes were generated for tracking and recording individual student interactions during tutorial sessions. Fourteen copies of the post learning student questionnaire were also produced for use during the small group trials.

Instructional Delivery

The CAI lesson, "The Basic Terminology of Typesetting", was delivered on April 23 and 25, 1991. Participants in the implementation phase consisted of fourteen individuals at Linotype Company who registered for a new internal training course on basic Macintosh operations and word processing. The individuals were randomly selected from a larger group of forty registrants and represented a diversified cross-section of the corporate population. The training course was divided into two segments consisting of seven students per segment. The CAI lesson provided an appropriate overview on the fundamentals of typesetting prior to the students' introduction to word processing.

Each student was assigned to a workstation consisting of a Macintosh IIci with operating software version 6.02 or later. The designer prepared each workstation in advance by loading the appropriate font files and runtime software into the system file on the hard disc of each Macintosh computer. In addition a tutorial folder was created on the main desktop menu entitled "The Basic Terminology of Typesetting" which contained the student versions of the pre-test and CAI tutorial.

The courseware designer introduced students to the field of CAI and the benefits of self paced instruction and provided a brief summary of lesson objectives and subject matter content covered within the context of the tutorial. Following the introduction, students were given an overview of the methods of evaluation and the testing methodology to be used and received a copy of the post-instruction assessment form with directions on its use and intended purpose.

Each participant was provided with two discs, one entitled *Pre-Test* and the other ***Lesson 1: The Basic Terminology*** both of which were used for recording responses during program interactions. Students were given directions on the use and function of the diskettes and instructions on how to find, access, and use the pre-test and CAI programs on their hard discs. Upon completion of the tutorial, students were requested to fill out and submit the assessment forms which they received along with any specific comments or suggestions which they may have had relative to the tutorial.

Data Collection

The data which was collected during each small group trial consisted of the scores from the pre-test and embedded tests as well as the responses from the post learning questionnaire. The pre-test and embedded test consisted of a combination of twelve fill in the blank and thirty-three matching questions. The pre-test and program records discs which were distributed to students prior to learning activities made use of a number of programmed variables designed to manage the data collection process.

The author of the program automated the process of tabulating student scores and mastery achievement, calculating the percentage of right and wrong answers, and tracking the overall amount of time spent within the tutorial, thus eliminating any manual dependence or requirements for students to record their own session results. Upon completion of the program all of the information identified above was automatically written to an external records file on the two floppy diskettes. Students returned the pre-test and lesson diskettes to the designer who then read the data out of the individual records files and recycled the discs for use with subsequent students.

The information from the pre-test, embedded tests and student assessment forms were utilized in the summative evaluation analysis prior to sending the software out to potential commercial distributors for product review. In addition, the designer had ample opportunity to assess the informal feedback from the target population based upon facilitation of the instructional session, personal observation, and one-on-one dialog with each participant. Data for the summative evaluation was based on a comparative analysis of pre and post test mean scores and time to completion. Segmentation and analysis of the post learning student assessment form was performed on each question and conclusions reported relative to student feedback distribution.

Summary

In this chapter an attempt was made to provide an overview of the approach which was used in the implementation phase of the CAI project. The reader was presented with:

1) a summary account of the learning and post-instructional materials which were produced prior to final program delivery

2) an overview of the proposed strategy and process for implementation

3) the methodology which was used for selection and segmentation of the target audience

4) an explanation of tools and procedures for collecting and recording data

5) the approach to summarizing and reporting the results of pre and post program learning analysis

CHAPTER 6

EVALUATION

Introduction

The program designer chose an evaluation approach which provided critical information and feedback on the value of the instructional materials and the effectiveness of the program design. By experimenting with individuals from diverse educational, socio-economic and professional backgrounds the designer was able to isolate specific audience characteristics, refine basic premises and assumptions relative to the target population and better define user profiles most likely to benefit from the instructional materials. Two kinds of evaluation were performed: a formative evaluation—to determine the types of alterations and changes required to improve program efficiency from an operational and instructional perspective and a summative evaluation—to assess and analyze the overall effectiveness of the computer-based training project.

Formative Evaluation

The basic goal of the formative evaluation was to collect detailed data relative to perceived deficiencies in program design, instructional clarity, and ease of use. Specific objectives for the evaluation were to:

- assess courseware effectiveness in meeting instructional objectives
- identify software bugs in courseware logic and design
- analyze specific program weaknesses related to the user interface, instructional methodology, presentation sequence, and screen design
- identify if the CAI was the appropriate length in keeping and maintaining learner attention and interest

- determine which topical areas should be added or deleted from the courseware

One-on-One Trials

There were six one-on-one trials conducted with representative members of the target population from Linotype Company. The trials took place during May of 1990 and included the Vice-Presidents of Marketing, Sales and Type Operations; the Market Manager for Type Products; the Manager of Training, and; Educational Services and the Apple Computer VAR Manager for Linotype Company.

The selected participants in the one-on-one evaluation were comprised of four men and two women between the ages of 38 and 52 whose educational backgrounds ranged from high school to college graduate. All participants held managerial positions, had diverse professional background, and were generally computer literate.

The instruction was delivered in each of the participant's offices on computer platforms which included the Mac SE, SE/30 and IIcx. Each of the participants were given the CAI tutorial and asked to provide real-time feedback on operational issues, ease of use, screen design, testing tools, and readability. As the intent of the initial one-on-one trials was to gather spontaneous participant feedback and informal commentaries no test scores were recorded and no structured student evaluations administered.

Each one-on-one trial was conducted in a similar fashion and consisted of the following sets of activities: the designer interviewed the perspective participant, explained the intent and purpose of the project, and solicited involvement. Dates and times were arranged for follow-up and administration in the participant's office spaces. Equipment availability presented no problem as each employee at the company has a Macintosh computer for business use.

At the specified time the designer provided the participant with the instructional materials, noted the start time, and explained that the participant should critique the materials as they progressed through the tutorial. When the participant expressed concern or a problem in following or understanding instructions or lesson content the designer made specific note of the nature of the problem and where in the sequence of instruction the difficulty occurred. All opinions and commentaries of the participants were noted and recorded. The average time to complete each one-on-one trial was 52 minutes.

After each one-on-one training session the lesson was modified to incorporate perceived features and functions which would enhance program design and operation. Participant's expressed a number of common concerns which included:

- preventing screens from going blank after operating instructions were displayed
- providing students with the right answer upon incorrect selection of alternatives
- providing a more detailed set of explanations on functions and procedures within the tutorial itself
- limiting the screen displays to major or 'key' information

Small Group Trials

In the small group trial the designer was fortunate enough to gain the cooperation of the Sales Training Group at Linotype Company who provided time during a New Hire Sales Training Class for administering the CAI tutorial. The tutorial substituted for a lecture-based segment of the training which covered parallel material. The small group trial took place during September of 1990 and included participation of sixteen professional sales representatives split into two groups of eight each, with varying educational backgrounds and computer experience. Participants were asked to run through the CAI lesson and comment on course logic; use of syntax, grammar, clarity and readability of the screen displays; the appropriateness of text and graphic content in reinforcing learning; testing vehicle design and user interface mechanics; feedback messaging, and ease of use.

The small group trial runs were administered in a classroom setting and all students were given a revised version of the software which had been modified as a result of the one-on-one trials. While no pre-tests were administered at this time, embedded test scores and time to lesson completion were noted, as were informal feedback and critical commentaries from participants. Additional modifications to program design were made based on the comments and suggestions received. These modifications included:

- significant alterations to the user interface and pull down menu structures
- elimination of redundant information on eight screens
- correction of two spelling errors which were not previously noticed
- integration of course navigation information within the context of the introductory sequence

For the sixteen representatives who participated in the small group trials the criteria for passing the embedded tests, which consisted of four separate quizzes, was an average score of 75 percent. See Table 3 for the results of the small group trial.

The mean score on the embedded tests was 78 percent and the average time to complete 50 minutes. The designer took note of the fact that 31 percent (5 out of 16) of participants in the small group trial failed to achieve a passing score. Upon further research into the backgrounds of the participants, it was discovered that all of the participants who had performed poorly shared a common characteristic: three of the students had no former hands-on experience with computer systems and two had minimal exposure to MS-DOS systems which was limited to spreadsheet software.

Table 3

Small Group Trial Results
n=16

Participant	Embedded Test Score	Time to Complete (Min.)
1	96	45
2	90	43
3	87	51
4	85	54
5	85	49
6	85	52
7	82	45
8	82	56
9	79	61
10	79	55
11	75	48
12	70	43
13	70	47
14	65	63
15	60	42
16	55	51
Mean Score	**78**	**50**

It was concluded that this lack of familiarity with the Macintosh operating system and user interface provoked a division in student attention between subject matter content and program operations to the extent that full comprehension and retention of the information within the tutorial was greatly hampered. An additional observation which was noted during administration of the small group trial was the diversity of attitudes exhibited by students towards computer-aided instruction. Student attitudes towards the method of educational delivery were for the most part evenly divided between apprehension, amusement, or exhilaration. Students who performed poorly during the small group trial generally fell into the first or second category.

Pilot Test

Based upon the preliminary reviews which were conducted and the scope of information and feedback received from subject matter experts, professional associates, and one-on-one and small group trial participants, the designer felt that the logistical problems associated with field trials and distribution of copyrighted software were too costly and would yield negligible results. Iterative modifications were made to the program based upon the extensive commentaries and feedback received which greatly improved the clarity, presentation style, and testing and feedback methods which were utilized in final program design.

Summative Evaluation

The summative evaluation utilized Kirkpatrick's (1987) model of analysis which is comprised of four distinct stages including reaction, learning, behavior and results. The final program design and student questionnaire were administered to a group of fourteen Linotype employees of diverse professional, socio-economic and educational backgrounds, and the subsequent data from this study was utilized as the foundation for assessing overall program relevance and value.

The target audience for the summative program were derived from registrants in an internal Macintosh operations course who possessed varying degrees of computer literacy ranging from none to moderate. In addition, the population was composed of individuals from diverse functional groups within the company including managerial, secretarial, and clerical workers from Human Resources, Accounting, Shipping, Marketing and Purchasing;.

Achievement and reaction to the course of training were as diverse and widespread as the backgrounds of the participants themselves. Pre and post test results used in conjunction with the post learning questionnaire revealed a number of interesting facts which helped refine initial assumptions relative to prerequisite knowledge and skill sets and the training program's fit within the corporate environment.

Reaction

The reaction stage of evaluation relates to the learner's perception of value and reaction to the training approach and content. Data for this stage of evaluation was derived primarily from the post-learning student assessment form as well as direct observation and dialog with participants. The student assessment form which was used was designed to be presented to students at the conclusion of the instructional segment and followed Kirkpatrick's guidelines of simplicity, ease of administration, and facility for quickly compiling and quantifying data.

Table 4 illustrates the results of the post learning questionnaire. Although fourteen individuals participated in the learning event only twelve responded and submitted the requested evaluation form.

Mean scores from the post learning questionnaire were calculated along a two dimensional matrix: participant overall course rating and participant ratings by individual questions. Out of the twelve respondents, 50 percent rated the course as above or greatly above average, and the remaining 50 percent as slightly above average. On a question-by-question basis fourteen out of nineteen questions received an above average cumulative rating and five out of nineteen close to an above average rating.

It is interesting to note that while the overall course received an enthusiastic response from most of the participants, there were isolated instances of individuals who had difficulties in following the tutorial instructions, understanding the subject matter content, or comprehending the objectives of the program.

In response to the question of relevance of course content to job, 75 percent indicated average or above average relevance and 25 percent minimal to no relevance to their job function. Additional commentaries included the perception that there was a disparity between the complexity of various portions of the tutorial and that there was too much knowledge to absorb in such a short period of time.

Table 4

Summative Questionniare Results
n=19

Question	Participant Number												Mean
	1	2	3	4	5	6	7	8	9	10	11	12	
1	5	5	4	5	4	3	3	5	4	5	2	3	4.0
2	5	5	4	5	4	3	3	4	3	3	3	3	3.7
3	5	5	5	5	3	5	4	5	4	2	2	4	4.0
4	4	5	5	5	4	5	3	4	2	2	3	4	3.8
5	5	5	5	5	4	3	3	4	4	4	3	5	4.1
6	5	5	5	5	4	3	4	4	4	4	4	5	4.3
7	4	5	5	5	4	4	3	5	4	3	4	4	4.1
8	5	5	5	4	4	3	4	4	4	1	4	5	4.0
9	5	5	5	4	4	3	4	5	3	4	3	4	4.0
10	5	5	5	3	3	3	3	5	2	4	0	4	3.8
11	5	5	5	5	4	2	3	4	3	4	4	4	4.0
12	5	5	5	5	4	3	4	4	4	4	4	5	4.3
13	5	5	4	3	4	2	4	0	3	4	0	4	3.8
14	5	5	5	4	4	3	3	5	4	3	3	4	4.0
15	5	5	5	5	4	4	3	5	4	3	2	4	4.0
16	5	5	5	4	4	4	3	5	3	3	3	5	4.0
17	5	5	5	5	4	4	3	4	4	3	4	5	4.2
18	5	5	5	5	4	3	3	0	4	3	4	4	4.0
19	5	5	5	3	4	3	4	0	4	3	3	4	3.6
Mean:	**4.9**	**5.0**	**4.8**	**4.5**	**3.9**	**3.3**	**3.4**	**4.5**	**3.5**	**3.2**	**3.2**	**4.2**	

The previously mentioned findings and commentaries are corroborated in the evident correlation between respondent post test scores and perception of job relevance, complexity of subject matter content, and difficulty of comprehension as discussed in the learning evaluation section below.

Learning

Learning was measured by comparing pre-test and post-test scores. The initial competency measure of 75 percent which was utilized in the formative evaluation segment, was changed to 85 percent for the summative evaluation. The decision to alter the effective passing score was based on the perception that the former rating index did not adequately prepare students for future tutorial segments which would draw and build on prior knowledge.

Of the fourteen individuals who were administered the pre-test no one succeeded in achieving a passing score. The cumulative mean score for the pre-test was 41 percent. The average time to tutorial completion was 50 minutes. Post test results reflected a group mean score of 86 percent. Upon closer examination, it was observed that six individuals (43 percent) failed to achieve the new baseline competency rating of 85 percent (Note: utilizing the former rating of 75 percent would have yielded a 93 percent success rate with 13 out of 14 participants achieving a passing score).

Despite the fact that a positive group mean score of 45 points was realized between the pre and post-test scores, the designer felt it incumbent upon himself to analyze the potential sources of the summative outcome. See Table 5 for a breakdown of the pre and post test scores which were collected .

Upon interpretation of the test data, post learning questionnaire, and individual interviews with course participants the designer attributed the widespread distribution of scores to the following factors:

- the size of the test group did not represent a statistically valid sample of the target population

- the prerequisite level of computer literacy/education was not met by all participants
- the perceived irrelevancy of some course elements to job performance by selected individuals impacted motivation level and interest
- the post test was designed to be taken as often as necessary until a specific competency level had been achieved. Participants in the summative trial were allowed only one pass at the post test
- all participant scores were negatively impacted by the subject area on type measurement: the most technically complex and lengthy segment of the tutorial

Table 5

Summative Evaluation Results
n=14

Participant	Pre-Test (%)	Post Test (%)	Gain Score(%)	Time(minutes)
1	65	98	33	45
2	54	84	30	50
3	50	85	35	57
4	47	92	45	46
5	41	83	42	43
6	13	80	67	60
7	35	75	40	45
8	32	78	46	55
9	22	65	43	22
10	34	87	53	65
11	36	100	64	55
12	31	88	57	50
13	47	92	45	53
14	68	97	29	45
Mean:	**41**	**86**	**45**	**50**

Behavior

No formal surveys or measurement tools have been implemented at this time for assessing the impact of the instructional unit upon participant behavior. "The Basic Terminology of Typesetting" is the first lesson in a series of CAI tutorials designed to introduce students to the concepts, principles, and applications of typesetting and design and serves as an information resource on which to build. The designer has concluded that a formal performance-based assessment benchmark would be the most effective vehicle for gauging student achievement. It is envisioned that this instrument would be administered when students have been trained in the specific page layout applications that will provide the context for demonstrating skill sets and applying the knowledge acquired through the CAI programs.

Informal conversations and observation of five of the program participants has indicated that their understanding and ability to grasp the basic concepts, tools, and functions in such applications as Microsoft Word and Quark Express have already been greatly enhanced by participation in the CAI program.

The designer performed a cumulative program review and evaluated the data which was gathered from a variety of sources. In assessing student scores, post learning questionnaire distributions, informal feedback from students and the variable factors responsible for trial participant performance, the designer has concluded that the instructional unit which has been developed reflects a high degree of reliability and validity and provides an effective vehicle for learning.

Valuable insight was derived from the formative and summative evaluation approaches, especially in the areas of subject matter complexity and target audience characteristics. One segment of the tutorial which dealt with detailed technical information proved to be an obstacle to student comprehension and negatively impacted at least one-third of all student's performance results.

On review of the specific subject area and extensive interviews with participants who performed poorly on the post-test it was found that the particular module of study was perceived to be the least relevant to job performance and would greatly benefit from both a shortening and simplification of technical content. In analyzing the overall results of participant performance the designer reviewed assumptions relative to pre-requisite skill sets and concluded that an intermediary level of computer literacy is recommended for optimal student performance.

The evaluation results, in addition, led to a realization that the tutorial as currently implemented shared a strong synergy with other delivery channels and thus a larger commercial distribution potential than initially conceived. Additional environments which are currently under consideration for targeted marketing include: 3rd party training organizations, computer system vendor's and university/continuing education facilities with graphic arts/publishing curricula.

Results

No formal surveys or measurement tools have been implemented at this time for assessing job performance gains in terms of productivity, quality or time savings. This type of evaluation will yield more tangible results once all participants have completed the full course of study. The designer envisions a control group study approach at a future time as the key methodology for providing concrete evidence of program value and effectiveness.

As this CAI course is intended to be a mass market software product distributed through third party channels, evaluations will be on-going and conducted vis-a-vis a survey card packaged with each version of the software. The survey card will integrate features from the student assessment and other checklist forms which were utilized during the summative evaluation stage and include sections for reporting program problems, weaknesses, and suggestions for improvement and revision.

The evaluation card will be included as part of a third party distribution agreement for maintaining and improving future product releases, and will be returned to the distributor by the end user and then forwarded to the developer for review. Respondent ratings and comments will be analyzed and segmented according to frequency of occurrence and revision efforts prioritized accordingly.

"Typesetting—A Tutorial for the Desktop Publisher" is a curricula which has been designed for commercial distribution. Program development expenses and cost of sales have been calculated against projected distribution volumes for determining retail pricing and thus do not provide a valid measure of end-user savings vs costs.

The potential value added of the product to corporate users is best determined by capital investment in the CAI program versus expenditures in alternative instructional solutions. See Table 6 for implementation costs and Table 7 for projected savings from the proposed instructional solution. The data included in these tables are based upon reasonable assumptions and projections made by the designer as well as available information sources relative to the average costs of instructional alternatives.

Table 6

Corporate Implementation Costs

Vehicle	Investment	Inst. Hrs.	Cost/hour	Students	Lost Work ($30 hr)	Invest.
CAI Tutorial	$ 300 package	6	$50	20	$ 3,600	$ 5,100
3rd Party	$ 500 person	8	$40	20	4,800	14,800
College Course	$ 700 person	36	$19	20	21,600	35,600

Table 7

Projected Savings

Savings Year 1	Savings Year 2	Savings Year 3	Cumulative Savings
$9,800-$30,500	$14,900-$35,600	$14,900-$35,600	$39,600-$101,700

In generating the cost savings data for Table 6 it should be noted that travel expense costs for individual participants in external training programs have not been factored into the analysis. It has been assumed that corporate buyers of the CAI tutorial will invest in a minimum of five copies per site or a total of $1,500.

It is evident that there is a direct relationship between the number of employees requiring training and the proportional cost savings to be realized between alternate modes of instructional delivery. Over a three year period of time (assuming 20 employees per year being trained) demonstrated savings of between $40,000 and $100,000 are possible (depending on the delivery vehicle selected) through purchase and implementation of the computer-based training program.

Learning Transfer

According to Broad (1988) learning transfer is "the effective application on the job of the knowledge and skills gained in training." Learning transfer is best achieved through the participation of the organization—including upper management, supervisory management, the trainer, and the trainee. It is essential that active support be given before, during, and after training. From the trainees perspective, two characteristics are of paramount importance: 1) a high motivation to succeed and 2) a strong internal locus of control and direction. While trainees may demonstrate these characteristics there are a number of secondary factors which inhibit the effective of transfer of learning. These include:

- lack of reinforcement on the job
- interference from the work environment
- a non-supportive organizational climate
- lack of relevance or priority of training to the trainee
- discomfort with change by the trainee

Within the context of delivery of the CAI tutorial at perspective customer sites the following guidelines detail what might be done in order to enhance learning transfer. Direct supervisors should allot themselves time to participate in the training event. This will provide an understanding of the relevance of the program and its application to the work environment. The recognition of program value will engender support by supervisory management and provide the foundation for another key condition of learning transfer—uninterrupted participation. Supervisors must provide their reports with ample time to participate in training and practice and apply what they have learned.

In order to demonstrate support for the training program and the importance which is placed upon it, supervisors may take a number of supportive actions. Special recognition may be bestowed upon individuals through maintenance of employee training records which are factored into annual performance reviews. Benefit incentives may be offered for above average improvement, and personalized certificates of recognition may be issued for course completion. In addition, participation by trainee's in work-related decisions regarding document design, layout and production will help reinforce learning transfer and build on-going motivation to excel.

Trained employee's in different work groups may also be utilized to effect the transfer of learning. Individuals may be assigned the responsibility of document production coordinator responsible for assisting new trainees in design and layout tasks until the entire group has been brought up to a common level of proficiency. In addition, pre- and post training baseline performance data may be used to compare group or departmental quality/production rates which may help stimulate healthy departmental competition for special recognition awards.

Summary

The program designer conducted formative and summative evaluations which provided valuable feedback on the value and effectiveness of program content and design. By isolating target audience characteristics the designer was able to refine operating assumptions related to the target population.

There were six one-on-one trials and one small group trial conducted with representative members of the target population which constituted the formative evaluation phase. After all training sessions the instructional unit was modified to reflect perceived features and functions which would enhance program design and operation.

The final program design was administered to a group of fourteen Linotype employees of diverse professional backgrounds and the data from the study were used for the summative evaluation phase in assessing program relevance and value. Pre and post tests were used in conjunction with a student questionnaire which helped the designer refine initial assumptions relative to pre-requisite knowledge and skill sets and the training program's fit within the corporate environment.

The formative and summative evaluation phase of this project were invaluable to the designer and provided:

- critical information which served as the foundation for courseware revision and final program distribution
- documentation which supported commercial product viability

- feedback on potential remedial requirements and other instructional segments for post training follow-up
- a definition of requirements for supplemental job aids and more advanced tutorials
- an identification of alternate training and learning approaches in the design and development of computer-based curricula for corporate personnel

CHAPTER 7

SUMMARY AND RECOMMENDATIONS

Introduction

In the final chapter of this document the designer provides a summary of the various phases of the CAI project, from analysis through implementation and evaluation. In addition, conclusions are developed relative to the perceived value and success of the instructional approach and its suitability to the corporate market. The chapter concludes with recommendations and insights regarding adaptation and expansion of the curriculum and suggestions for future development activities.

Methods and Procedures Used

The methodology which was utilized in development of this computer-based training program was derived from the formal structure for courseware development known as the Instructional Systems Design model (ISD). The model consists of five distinct phases which include: analysis, design, development, implementation, and evaluation. A summary of each project phase is described within the context of the ISD model and presented below.

Analysis

The designer utilized over ten years of publishing industry experience to analyze specific training needs in a variety of corporate and commercial settings. In addition, in-depth research into existing subject matter resources and instructional alternatives was conducted. Automated key-word queries were performed on a number of periodical data bases which focused on the topics of typesetting, document production, desktop publishing, and computer assisted instruction.

During the formative stages of project research a job-task analysis was performed and a profile of the target population was developed. The designer identified related learning theory, formulated instructional goals, and defined the major tasks and topical content of the tutorial. In addition, the analysis phase of the project consisted of the selection of appropriate media for instructional delivery, an estimate of student effort and course duration, and the specification of anticipated learning outcomes.

In the latter part of the analysis phase the designer formulated a project plan which included an identification of milestones, dates, and deliverables. A detailed projection of anticipated costs was specified and a budgetary estimate for program development, implementation, and delivery was developed.

Design

The designer performed an instructional task analysis in order to identify the knowledge and skills required to perform each instructional goal. In addition, instructional objectives were grouped and organized into logical sequences and pre-requisite behaviors were defined.

The designer proceeded to identify specific learning activities associated with the subject matter and partitioned tutorial content into logical modules. A learning activity instructional strategy matrix was developed, which identified each learning activity and its instructional method. Computer-based media was selected as the most appropriate delivery vehicle for the course of instruction.

The designer further identified criterion referenced pre-tests and embedded tests as the most suitable methodology for assessing and quantifying learning transference. It was determined that the evaluation system used would include both formative and summative techniques. Existing course and reference materials were reviewed and determined to be unsuitable for inclusion in the project.

Development

The designer created the instructional materials using a top-down design and produced programmer ready materials prior to code development. A flow chart, diagramming overall program logic was generated and Gagne's nine events of instruction served as the model for content presentation. Upon completion of the program all materials were reviewed for language, grammar, and spelling accuracy by several subject matter experts and professional associates. In addition, the effectiveness and accuracy of the instructional materials were confirmed. Relevant evaluation and assessment instruments were designed during the development stage. The appropriate number of computer-based programs, pre-tests, and attitude questionnaires were produced for program trial and implementation.

Implementation

During project implementation, the CAI program and run-time version of the software were reproduced and packaged for delivery to members of the target population. The instructional unit was presented to selected individuals from the target population, critical observations were made, and data in the form of test scores, rating checklists, and participant feedback was collected for the summative evaluation. In addition, data was also collected relative to the amount of time spent by members of the target population on the lesson of study.

Evaluation

The designer performed two kinds of evaluation. A formative evaluation was conducted to determine the kinds of program modifications required to improve efficiency and operational ease. In addition, a summative evaluation was performed to assess and analyze the overall effectiveness and value of the computer-based training project. In total, thirty-six individuals from the target population at Linotype Company participated in the one-on-one, small group, and summative evaluations.

Based on the results of the one-on-one and small group trials, the designer made modifications to the computer-based program.

The final program design and student questionnaire were administered to a group of fourteen Linotype employees of diverse backgrounds. The data from the study was used to assess program relevance and value. Pre- and post test results revealed a number of key facts which helped refine previous assumptions relative to the training program's fit within the corporate environment. Based on direct observation and the evaluation instruments which were administered, there was a very positive reaction to both the content and the training delivery vehicle. The designer suggested ways to effectively transfer learning to the job and assessed bottom-line benefits based upon program costs and alternative modes of training delivery.

Conclusions

The course of study which has been the subject of this paper evolved over the course of the past eighteen months. During this time period preliminary thoughts emerged into concrete ideas and tentative designs into working computer software. The initial foundation for course development grew out of an appreciation for subject matter content and a perceived need within corporate America. Building a unit of instruction which would meet the test of real-world applications however, was a matter of trial and error and perseverance.

Initial efforts at isolating relevant content for instruction depended on prioritizing key knowledge and skill sets critical for work performance. Integrating identified areas of knowledge into structured learning events, which would both stimulate and hold student interest, was the paramount design challenge.

In reviewing student reactions, during and after course administration, the designer perceived a high degree of interest in CAI as a medium of instruction. The flexibility of the user interface provided an impetus for student exploration. Excitement with the tools for learning and the stimulation to interact and play with the media were key factors in the general success of the learning event. The ability of individual students to guide themselves and manipulate their private learning environments were challenges to which participants responded strongly.

For the majority of participants whom the designer has observed, transfer of learning to the job has occured and has had a definite impact on productivity. The CAI tutorial helped students develop the necessary pre-requisite knowledge for understanding basic typesetting functions. In addition, the understanding of the subject matter is consistently reinforced by the high incidence of recall required by iterative use of the applications software tools used for document production.

The degree of synergy between the instructional unit and work performance has proven to be quite high. It appears that this training program is an appropriate and effective vehicle for training desktop publishing professionals in the fundamental principles and terminology of typesetting. The results of this project have demonstrated that there is a definite need for self-paced training curriculums within the corporate environment and that computer-based training is an appropriate methodology for meeting this need.

Recommendations

1. The subject matter for the CAI tutorial on typesetting has a cross-cultural relevance. Since the principles, concepts and terminology of layout, design and composition are common to diverse Western cultures, tutorial content lends itself well to translation and adaptation into foreign languages. In the initial design stages, screens were composed with ample space surrounding the displays so that textual elements could be translated into foreign languages and suitably fitted for display with a min-

imum of restructuring. In addition, simple graphic elements were selected which, with little or no modification, could be easily ported and adapted for use.

2. The original concept for the unit of study "Typesetting—A Tutorial for the Desktop Publisher" consisted of three lesson areas: The Basic Terminology, The Principles of Layout and Design, and the Aesthetic Use of Type. The three lessons were intended to build logically upon each other as they moved the learner from the simple to the complex in a series of graduated steps. Development and completion of these three study units by other interested professionals would provide a computer-based curriculum capable of addressing a vast majority of corporate training needs in the area of document design and production.

3. A 740K delivery media was chosen to facilitate commercial product distribution to the complete family of Macintosh computer systems. This factor was a key limitation in program development. Expanding the delivery vehicle to dual-density 1.4 megabyte discs or 45 megabyte removable cartridges would provide extended flexibility (at a higher cost) and a greater degree of creative freedom in program design. Highly interactive sequences might be included with enhanced graphics or animation and audio for demonstration, simulation, and narrated interpretations of key concepts. Sophisticated branching logic and remedial pathways based on student responses could be incorporated. Performance-based evaluation tools could also be employed which could accommodate diverse learning styles and greatly facilitate more supportive learning contexts.

4. Altering the "verbal information" orientation of the tutorial could greatly enhance learning retention and transfer. Current program design focuses on mastering an extensive set of definitions up-front and recognizing the appropriate use and application of key principles. Utilizing an "on-demand" methodology of training, wherein key terms and definitions are introduced and presented only when they are

required may be a desirable alternate approach. The approach would engage students in the process of document design from the very beginning. By demanding students to make uninformed choices and forcing a high degree of interactivity in the midst of uncertainty, a context for automated feedback and intelligent selection is nurtured. The computer begins to assume the role of a chess partner, responding and reacting to the "situational" imprint and unique signature of the student as he or she masters the subject matter content.

Concluding Statement

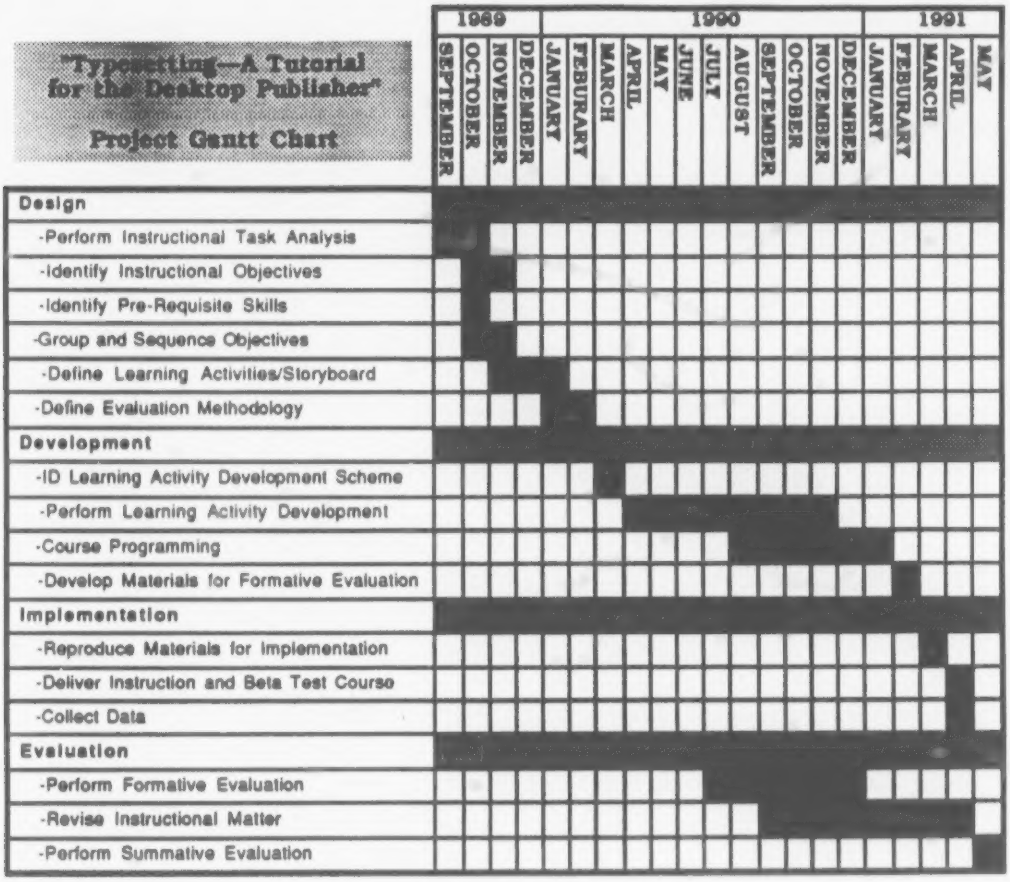
The advent of the micro-computer age has been aptly named the "age of information." As the cost of technology continues to fall and the tools for productivity become more powerful, the foundation of our educational and communication systems are being radically transformed. Critical choices are in the making, as humanity must choose to embrace the tools of change or halt its evolution. Mankind has come full circle. The age of the craftsman gave rise to an economy where individuals controlled the tools of production. The industrial age witnessed the subservience of man to machine. The information age beckons a return to the age of the craftsman where electronic tools now offer to extend the reach of our imagination and creativity.

Computer-based instruction as a vehicle for instructional delivery is still in its infancy. Early models of computerized instruction were little more than electronic "page turners." Today we are offered a plethora of media ranging from expert systems capable of intelligent adaptation to digitally based interactive systems offering real-time video and audio. Programming languages which drive development efforts have evolved at a breakneck pace, placing icon-based development tools in the hands of myriads of users.

The barrier which now confronts our intelligent use of new technologies is the skill of the "artisans" fashioning the next-wave of educational products. Tools in the hands of the unskilled craftsman are unlikely to produce practical results. Software products produced by programmers unfamiliar with the foundations of learning and instructional design are in the same manner likely to miss the mark. In the long run the worth of our educational software must be evaluated by the tangible results which they produce, and the increased workforce productivity for which they are responsible.

Successfully meeting the challenge ahead will depend upon our openness to change and our commitment to personal and professional growth. Our future as a global culture will rely on the dedication of individuals willing to take a stand for excellence and professional accountability...to move beyond the confines of their own limited vision into a new paradigm of possibility.

APPENDIX A—PROJECT GANTT CHART



"Typesetting—A Tutorial for the Desktop Publisher"

Project Gantt Chart

	1989				1990												1991				
	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBURARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBURARY	MARCH	APRIL	MAY
Design	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
-Perform Instructional Task Analysis	■	■																			
-Identify Instructional Objectives		■	■																		
-Identify Pre-Requisite Skills		■																			
-Group and Sequence Objectives		■	■																		
-Define Learning Activities/Storyboard			■	■	■																
-Define Evaluation Methodology					■	■															
Development	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
-ID Learning Activity Development Scheme							■														
-Perform Learning Activity Development								■	■	■	■	■	■	■	■						
-Course Programming												■	■	■	■	■	■				
-Develop Materials for Formative Evaluation																		■			
Implementation	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
-Reproduce Materials for Implementation																			■		
-Deliver Instruction and Beta Test Course																				■	
-Collect Data																				■	
Evaluation	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
-Perform Formative Evaluation											■	■	■	■	■	■					
-Revise Instructional Matter													■	■	■	■	■	■	■	■	
-Perform Summative Evaluation																					■

APPENDIX B—TASK ANALYSIS

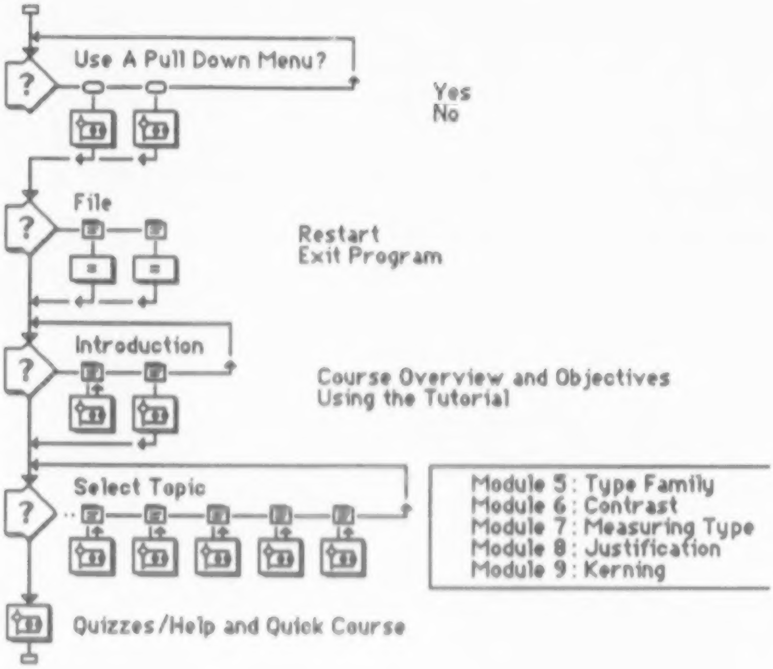
Lesson 1: Task Analysis

1. Identify and Define the Components of Type Including:
    - 1.1 Lowercase Characters
    - 1.2 Uppercase Characters
    - 1.3 Baseline
    - 1.4 X-Height
    - 1.5 Ascender
    - 1.6 Descender
    - 1.7 Counter
    - 1.8 Serif
    - 1.9 Sans Serif
2. Identify and Define a Typeface Including:
    - 2.1 Shape
    - 2.2 Length of Ascenders
    - 2.3 Size of X-Height
    - 2.4 Serifs
3. Identify and Define a Font Including:
    - 3.1 Character Sets
    - 3.2 Text Type
    - 3.3 Display Type
4. Identify and Define Typestyle Variables Including:
    - 4.1 Roman Type
    - 4.2 Italic Type
    - 4.3 Small Caps
    - 4.4 Light Face
    - 4.5 Semi-bold Face
    - 4.6 Bold Face
    - 4.7 Extra Bold Face
    - 4.8 Condensed Type
    - 4.9 Extended Type
    - 4.10 Light Condensed
    - 4.11 Semi-bold Condensed
    - 4.12 Oblique Type
    - 4.13 Expanded
    - 4.14 Demi-bold Type
5. Identify and Define a Type Family Including:
    - 5.1 Representative Examples:
        - Times
        - Helvetica
        - Geneva
        - Chicago
6. Identify and Define the Typographic Units of Measure Including:
    - 6.1 Points
    - 6.2 Picas
    - 6.3 Units
    - 6.4 Bodysize
    - 6.5 Line Spacing
    - 6.6 Leading
    - 6.7 Set Solid
    - 6.8 Set Width
    - 6.9 Measure
    - 6.10 Em Space
    - 6.11 Unit System
    - 6.12 Unit Value

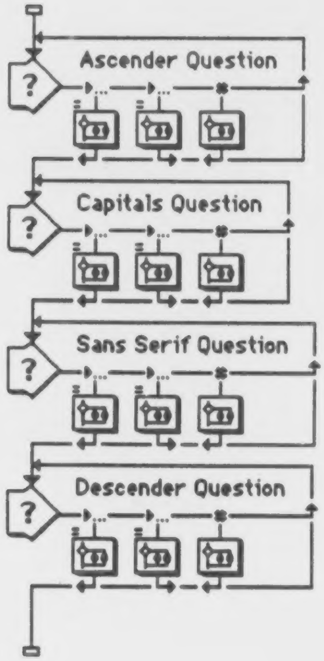
   6.13 Letter Spacing
   6.14 Normal
   6.15 Loose
   6.16 Tight
   6.17 Very Tight
7. Identify and Define Contrast Variables Including:
   7.1 Size
   7.2 Weight
   7.3 Width
   7.4 Form
   7.5 Structure
   7.6 Posture
   7.7 Placement
8. Identify and Define the Methods of Justification Including:
   8.1 Word Space
   8.2 Ragged Right
   8.3 Ragged Left
   8.4 Centered
   8.5 Justified
9. Identify and Define Kerning Including:
   9.1 Negative Letterspacing

APPENDIX C—PROGRAM CODE

Main Pull-Down Menu Structure


Use A Pull Down Menu?
Yes
No
File
Restart
Exit Program
Introduction
Course Overview and Objectives
Using the Tutorial
Select Topic
Module 5 : Type Family
Module 6 : Contrast
Module 7 : Measuring Type
Module 8 : Justification
Module 9 : Kerning
Quizzes/Help and Quick Course

Sample Quiz Segment


Ascender Question
?
Capitals Question
?
Sans Serif Question
?
Descender Question
?

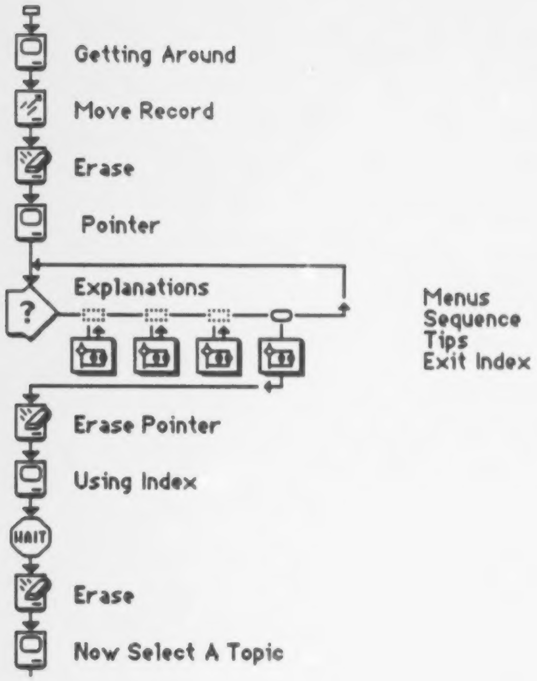
+Ascender|Acsender|Asender|Acender
–*
Try Limit

+Uppercase|Caps|Upper Case
–*
Try Limit

+Sans Serif|sanserif|san serif|sansserif|sans
–*
Try Limit

+Descender|Desender|Decender
–*
Try Limit

Sample Course Flow Sequence


Getting Around
Move Record
Erase
Pointer
Explanations
Menus
Sequence
Tips
Exit Index
Erase Pointer
Using Index
WAIT
Erase
Now Select A Topic

APPENDIX D—CRITERION REFERENCED QUIZ SAMPLE

Quiz 3: Fill In the Blank

- 1/4 OF AN INCH
- COLUMN DEPTH
- DISPLAY TYPE
- EM
- FOURTEEN PTS.
- LEADER
- LEADING
- LETTERSPACING
- LINE LENGTH
- LOOSE
- NORMAL
- ONE INCH
- PICAS
- POINT SIZE
- POINTS
- SET WIDTH
- SIX
- SIZE
- SOLID
- TEXT TYPE
- TIGHT
- TWELVE
- TWELVE POINTS
- UNIT VALUE
- UNITS
- VERY TIGHT
- WORD SPACES

- The three basic terms of measurement in typesetting are points, units and ______.
- Points are used to measure the type_____?
- Picas are used to measure the line length and the _______ _______?
- A pica equals ____ ______?
- There are ______ picas in an inch?
- Seventy two points equals ____ ____?
- _____ are used to measure the width of individual characters?
- The distance between the top of the ascender and the bottom of the descender is called the _______ of the typeface?
- Display type is type over ____ _______?
- The two basic size categories of type are text type and ________ _____?
- The space between lines is called the ________?
- When type is set at the same point size as the typeface without adjusting the space between lines, it is called set ______?
- The first figure in 10/11 is called the _____ ______?
- The second figure in 10/11 is called the ___________?
- A square of a specific typesize through which relative values are derived is called an ___ _______?
- By subdividing an em into vertical segments we derive ________?
- The set width of a character when it is expressed in units is called the _____ _____ of the character.
- The fixed amount of space surrounding each character is known as ___ ____?
- The space between characters is known as ________________?

APPENDIX E—EVALUATION INSTRUMENTS

Instructional Adequacy

	Very Poor 1	Below Avg. 2	Avg. 3	Above Avg. 4	Very Good 5
Design					
• Factual Accuracy	☐	☐	☐	☐	☐
• Relationship to Objectives	☐	☐	☐	☐	☐
• Acceptability	☐	☐	☐	☐	☐
• User Response	☐	☐	☐	☐	☐
• Examples Provided	☐	☐	☐	☐	☐
• Sequence of Lesson	☐	☐	☐	☐	☐
• Practice Provided	☐	☐	☐	☐	☐
• Feedback Provided	☐	☐	☐	☐	☐
• Lesson Logic	☐	☐	☐	☐	☐
• Distribution of Emphasis	☐	☐	☐	☐	☐
• Relevance	☐	☐	☐	☐	☐
• Meaningfulness	☐	☐	☐	☐	☐
• Step Size	☐	☐	☐	☐	☐
• Guidance	☐	☐	☐	☐	☐
Procedures					
• Directions	☐	☐	☐	☐	☐
• Interaction During Lesson	☐	☐	☐	☐	☐
• Personalization	☐	☐	☐	☐	☐
• Pacing	☐	☐	☐	☐	☐
• Control Options	☐	☐	☐	☐	☐
• Motivational Aspects	☐	☐	☐	☐	☐
Efficiency					
• Leaness	☐	☐	☐	☐	☐
• Record Keeping	☐	☐	☐	☐	☐
• Adaptivity	☐	☐	☐	☐	☐
• Amount of Practice	☐	☐	☐	☐	☐
• Individualization of Lesson	☐	☐	☐	☐	☐
Clarity					
• Readability	☐	☐	☐	☐	☐
• Ease of Comprehension	☐	☐	☐	☐	☐
• Text Clarity	☐	☐	☐	☐	☐
• Graphics Fidelity	☐	☐	☐	☐	☐
• Sound Fidelity	☐	☐	☐	☐	☐
• Ease of Locating Information	☐	☐	☐	☐	☐

Cosmetic Adequacy

	Very Poor 1	Below Avg. 2	Avg. 3	Above Avg. 4	Very Good 5
Appearance					
• Appeal	☐	☐	☐	☐	☐
• Typographical Accuracy	☐	☐	☐	☐	☐
• Frame Protocol	☐	☐	☐	☐	☐
• Visual Appeal	☐	☐	☐	☐	☐
• Animation	☐	☐	☐	☐	☐
• Use of Available Screen Space	☐	☐	☐	☐	☐
Clarity					
• Screen Density	☐	☐	☐	☐	☐
• Display Clarity	☐	☐	☐	☐	☐
• Personalization	☐	☐	☐	☐	☐
• Amplification	☐	☐	☐	☐	☐
• Interpretability of Display Elements	☐	☐	☐	☐	☐
• Motivational Aspects	☐	☐	☐	☐	☐

Program Adequacy

	Very Poor 1	Below Avg. 2	Avg. 3	Above Avg. 4	Very Good 5
Design					
• Execution Commands	☐	☐	☐	☐	☐
• Consistency with Flowchart	☐	☐	☐	☐	☐
• Lesson Execution	☐	☐	☐	☐	☐
• Programming Loops	☐	☐	☐	☐	☐
• Efficiency	☐	☐	☐	☐	☐
• Security	☐	☐	☐	☐	☐
• Response Anticipation	☐	☐	☐	☐	☐
• Display Accuracy	☐	☐	☐	☐	☐
Procedures					
• Disc Management	☐	☐	☐	☐	☐
• Documentation	☐	☐	☐	☐	☐
• Start Up Procedures	☐	☐	☐	☐	☐
• Modifiability	☐	☐	☐	☐	☐
• Consistency Within	☐	☐	☐	☐	☐
• Consistency from Lesson to Lesson	☐	☐	☐	☐	☐
Efficiency					
• Speed of Execution	☐	☐	☐	☐	☐
• Use of Variables	☐	☐	☐	☐	☐
• Data Storage and Retrieval	☐	☐	☐	☐	☐
• Tightness of Program Code	☐	☐	☐	☐	☐
• Individualization of Lesson	☐	☐	☐	☐	☐

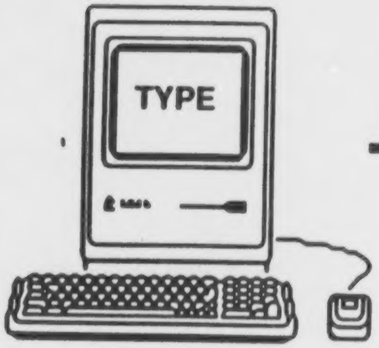
Curriculum Adequacy

	Very Poor 1	Below Avg. 2	Avg. 3	Above Avg. 4	Very Good 5
Design					
• Portability	☐	☐	☐	☐	☐
• Accomodation of Teacher Styles	☐	☐	☐	☐	☐
• Accomodation of Student Styles	☐	☐	☐	☐	☐
• Lesson Options	☐	☐	☐	☐	☐
• Integration of Subject Matter	☐	☐	☐	☐	☐
• Information Durability	☐	☐	☐	☐	☐
• Hardware Restrictions	☐	☐	☐	☐	☐
• Support Materials	☐	☐	☐	☐	☐
• Tie-in to Curriculum	☐	☐	☐	☐	☐
Procedures					
• Flexibility	☐	☐	☐	☐	☐
• Familiarity	☐	☐	☐	☐	☐
• Effectiveness	☐	☐	☐	☐	☐
• Consistency	☐	☐	☐	☐	☐
• Compatability	☐	☐	☐	☐	☐
• Acceptability	☐	☐	☐	☐	☐
• Expandability	☐	☐	☐	☐	☐
• Running Time	☐	☐	☐	☐	☐

Student Assessment

	Very Poor 1	Below Avg. 2	Avg. 3	Above Avg. 4	Very Good 5
Design					
• Readability	☐	☐	☐	☐	☐
• Ease of Comprehension	☐	☐	☐	☐	☐
• Text Clarity	☐	☐	☐	☐	☐
• Clarity of Directions and Content	☐	☐	☐	☐	☐
• Graphics Fidelity	☐	☐	☐	☐	☐
• Sound Fidelity	☐	☐	☐	☐	☐
• Ease of Locating Information	☐	☐	☐	☐	☐
• Length of Course	☐	☐	☐	☐	☐
Curriculum					
• Overall Course Evaluation	☐	☐	☐	☐	☐
• Clarity of Instructional Goals	☐	☐	☐	☐	☐
• Clarity of Performance Objectives	☐	☐	☐	☐	☐
• Organization of Material	☐	☐	☐	☐	☐
• Coverage of Subject	☐	☐	☐	☐	☐
• Relevance of Course Content to Job	☐	☐	☐	☐	☐
• Relevance of Practice Exercises	☐	☐	☐	☐	☐
• Testing and Evaluation Methods	☐	☐	☐	☐	☐
• Level of Difficulty	☐	☐	☐	☐	☐
• Sequencing of Lesson	☐	☐	☐	☐	☐
• Feedback Provided	☐	☐	☐	☐	☐
• Lesson Logic	☐	☐	☐	☐	☐

APPENDIX F—ORIGINAL STORYBOARD DESIGN



Typesetting

A Tutorial for the Desktop Publisher

© 1989 Linotype Company

PRESS RETURN OR
CLICK CURSOR ON HAND TO CONTINUE

Display I.D.
Title Page

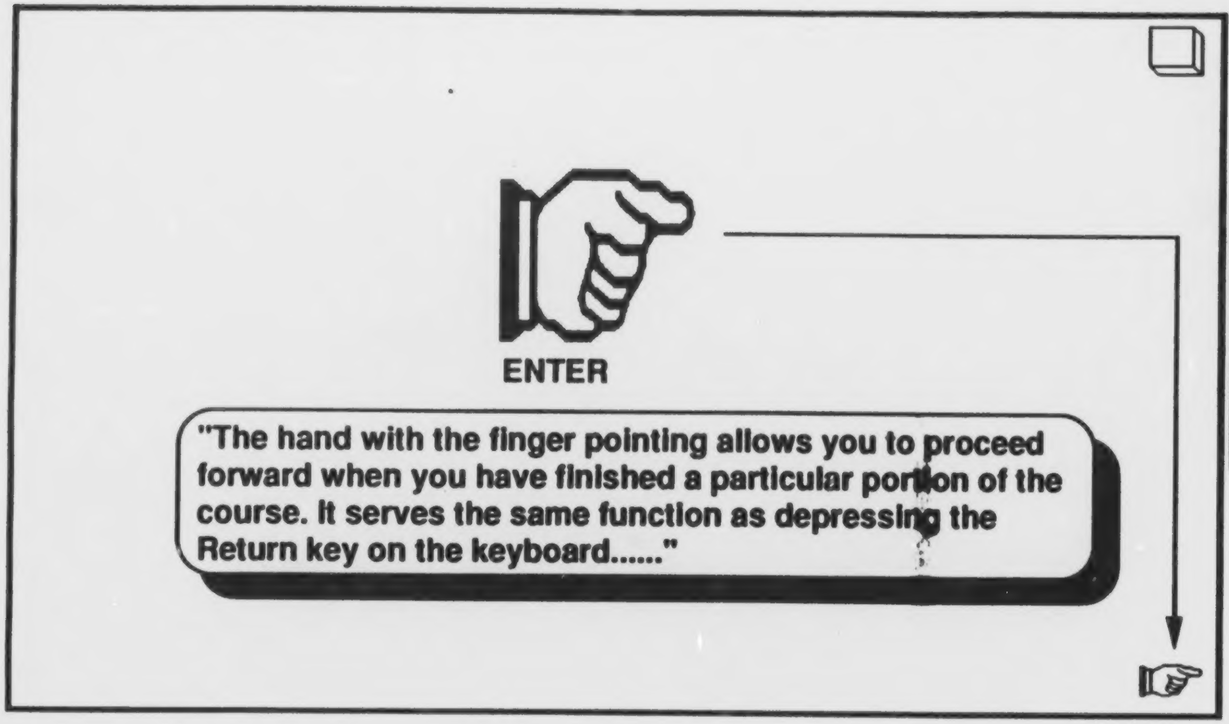
Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:
TP 1.

COMMENTS:



"The hand with the finger pointing allows you to proceed forward when you have finished a particular portion of the course. It serves the same function as depressing the Return key on the keyboard......"

Display I.D.

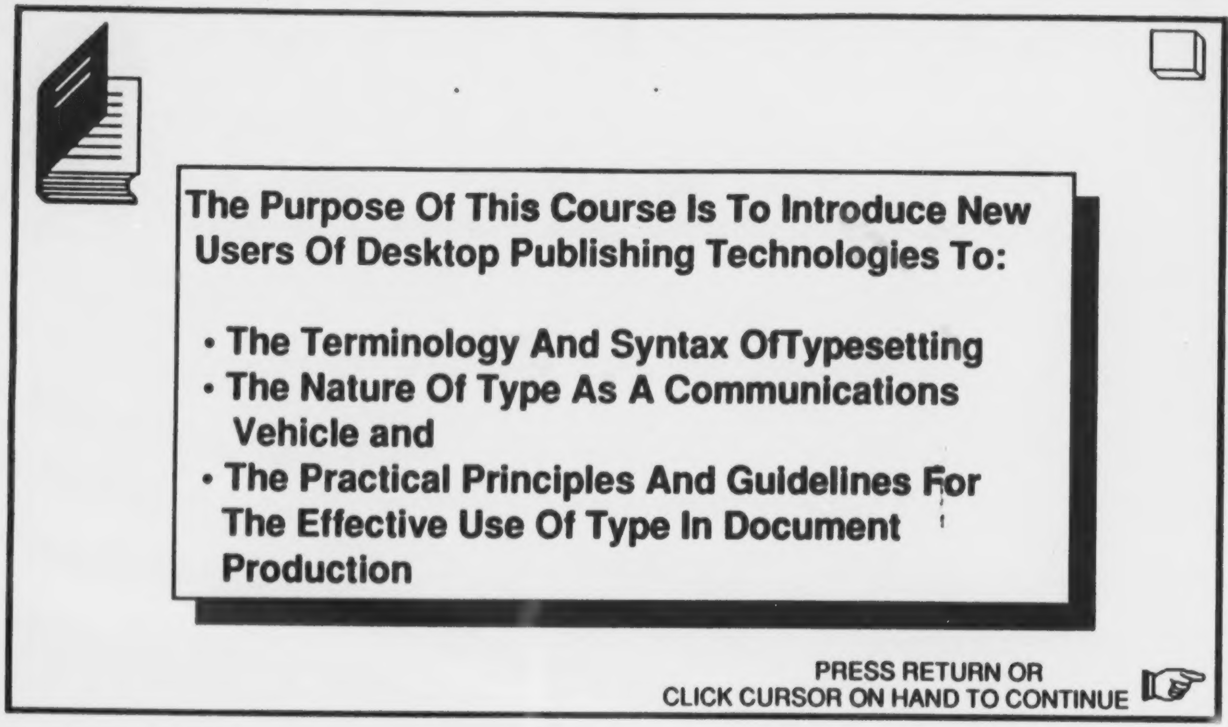
Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:



The Purpose Of This Course Is To Introduce New Users Of Desktop Publishing Technologies To:

- **The Terminology And Syntax OfTypesetting**
- **The Nature Of Type As A Communications Vehicle and**
- **The Practical Principles And Guidelines For The Effective Use Of Type In Document Production**

PRESS RETURN OR
CLICK CURSOR ON HAND TO CONTINUE

Display I.D.
Course Objectives

Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:
CO1

COMMENTS:

Upon completion of this course students will be able to:

- **define the basic terminology used in typesetting and demonstrate their practical applications**
- **identify and distinquish betwen good and bad typographic practices**
- **apply an understanding of typesetting principles in the design and creation of standard document types.**

Display I.D.
Course Objectives

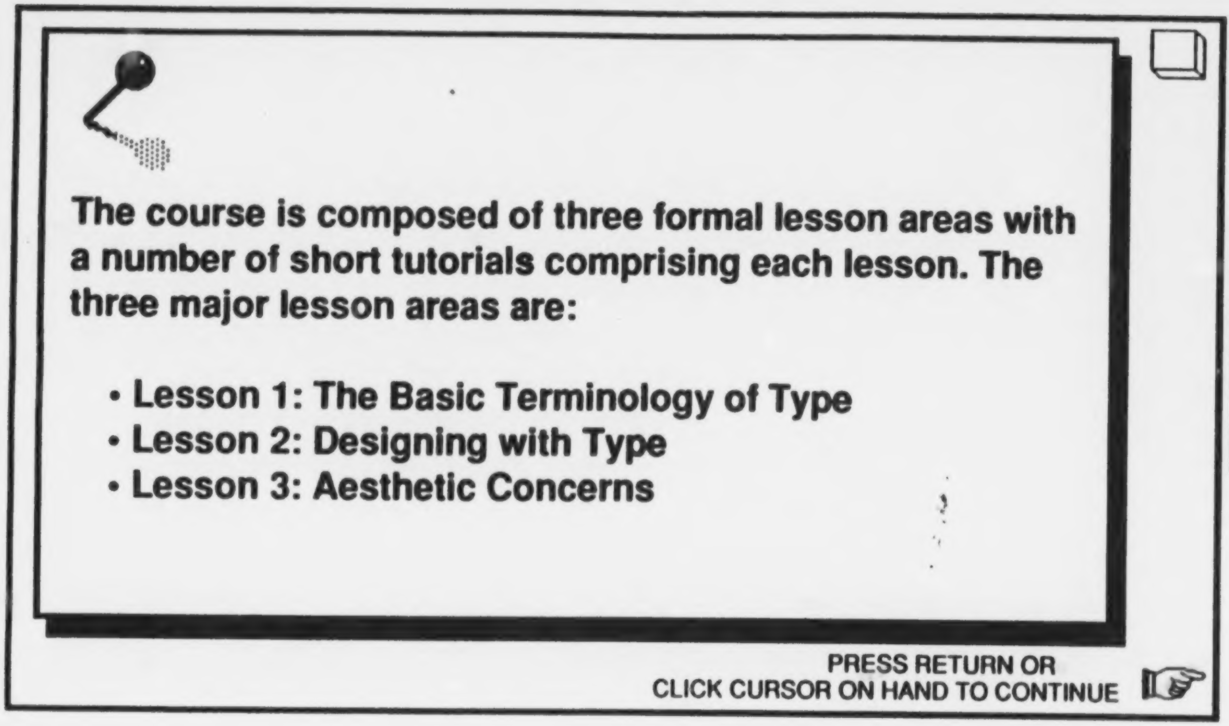
Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:



The course is composed of three formal lesson areas with a number of short tutorials comprising each lesson. The three major lesson areas are:

- Lesson 1: The Basic Terminology of Type
- Lesson 2: Designing with Type
- Lesson 3: Aesthetic Concerns

PRESS RETURN OR
CLICK CURSOR ON HAND TO CONTINUE

Display I.D. Course Objectives

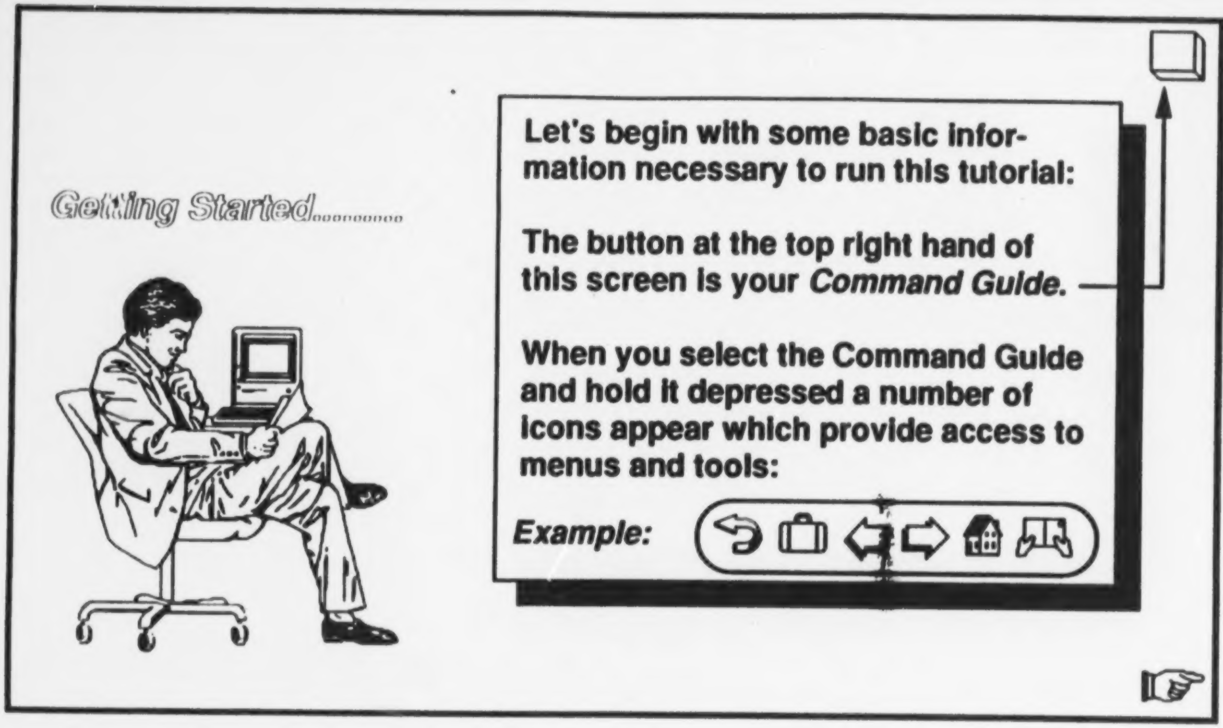
Course: Type Tutorial

Author: Andrew Gelfand

Date: April 1989

Sequence:

COMMENTS:



Let's begin with some basic information necessary to run this tutorial:

The button at the top right hand of this screen is your *Command Guide.*

When you select the Command Guide and hold it depressed a number of icons appear which provide access to menus and tools:

Example:

Display I.D.

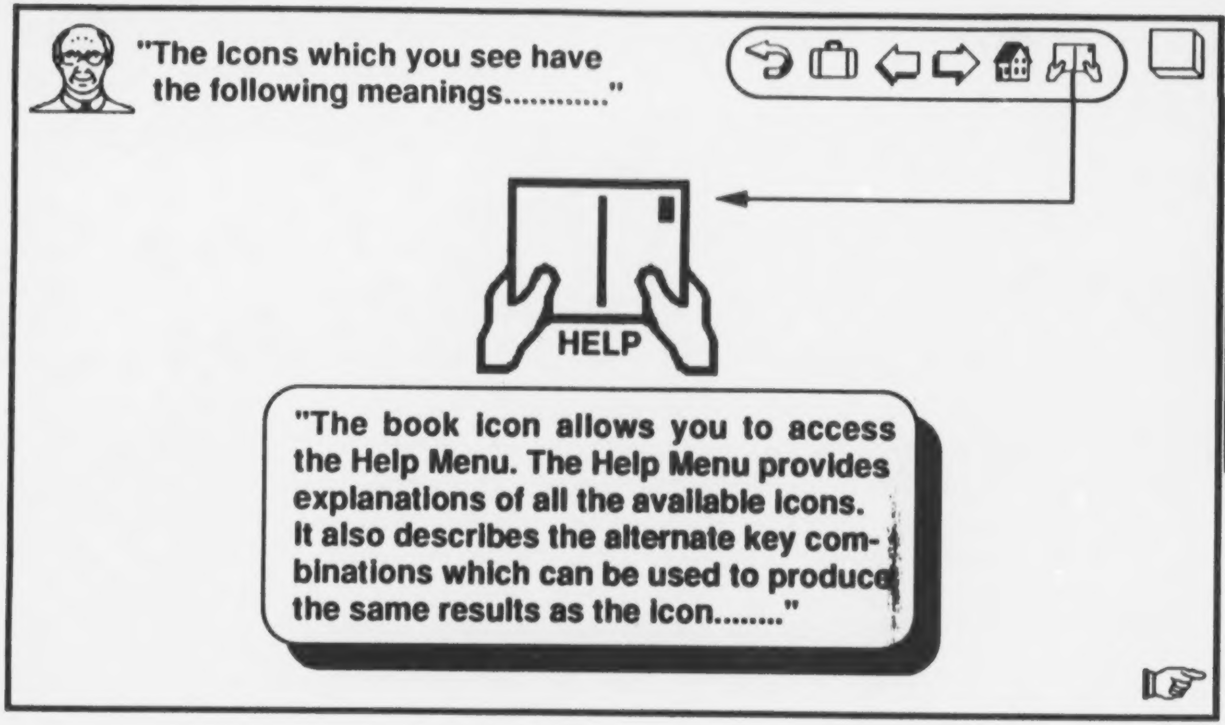
Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:



"The Icons which you see have the following meanings............"

"The book icon allows you to access the Help Menu. The Help Menu provides explanations of all the available icons. It also describes the alternate key combinations which can be used to produce the same results as the icon........"

Display I.D.
Help Intro.

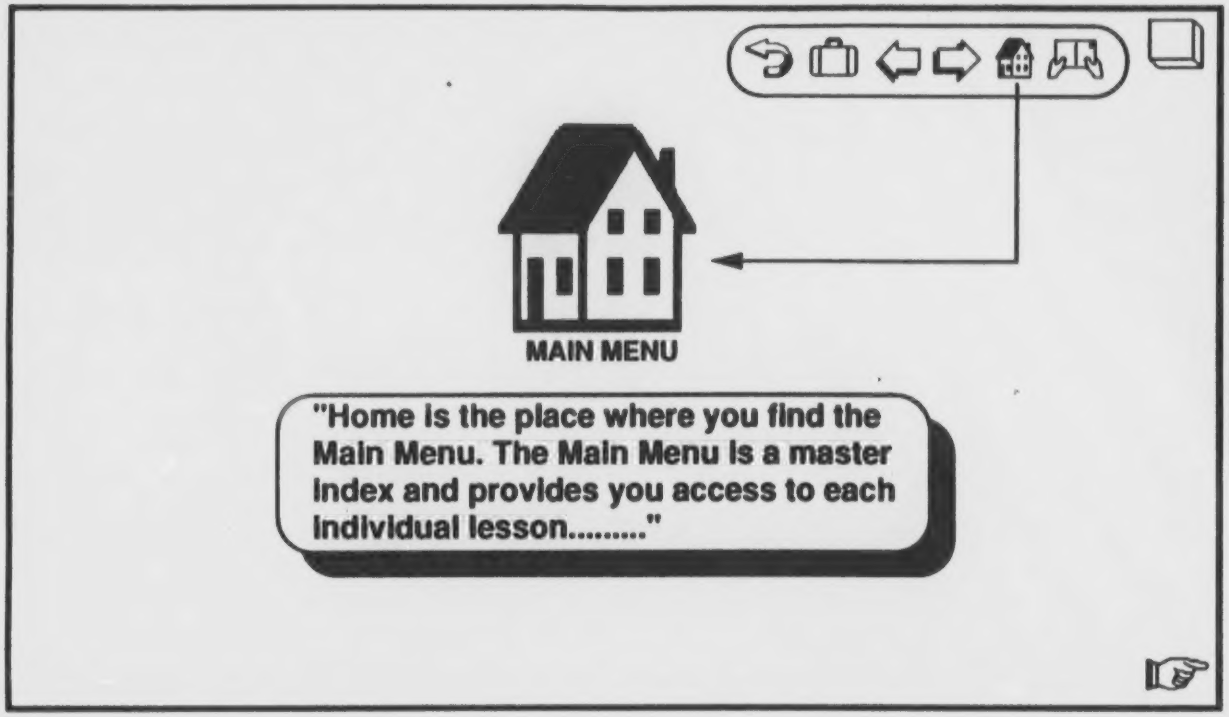
Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:
HI

COMMENTS:



"Home is the place where you find the Main Menu. The Main Menu is a master index and provides you access to each individual lesson........."

Display I.D.

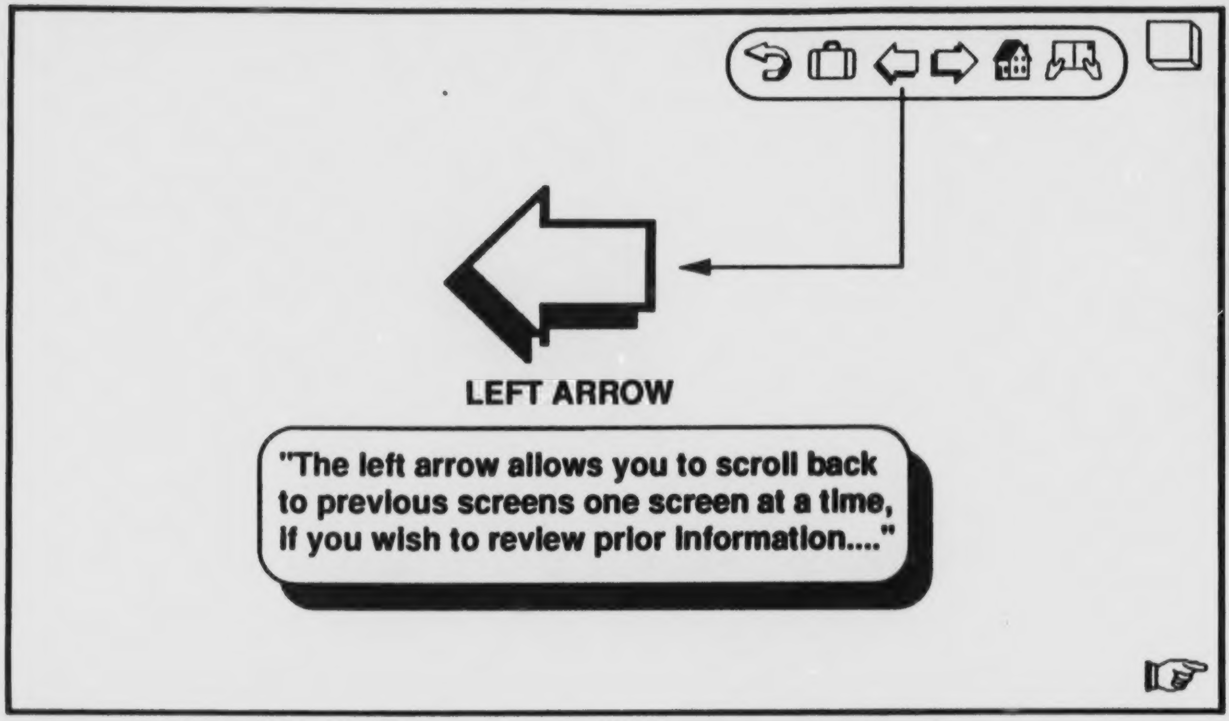
Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:



LEFT ARROW

"The left arrow allows you to scroll back to previous screens one screen at a time, if you wish to review prior information...."

Display I.D.

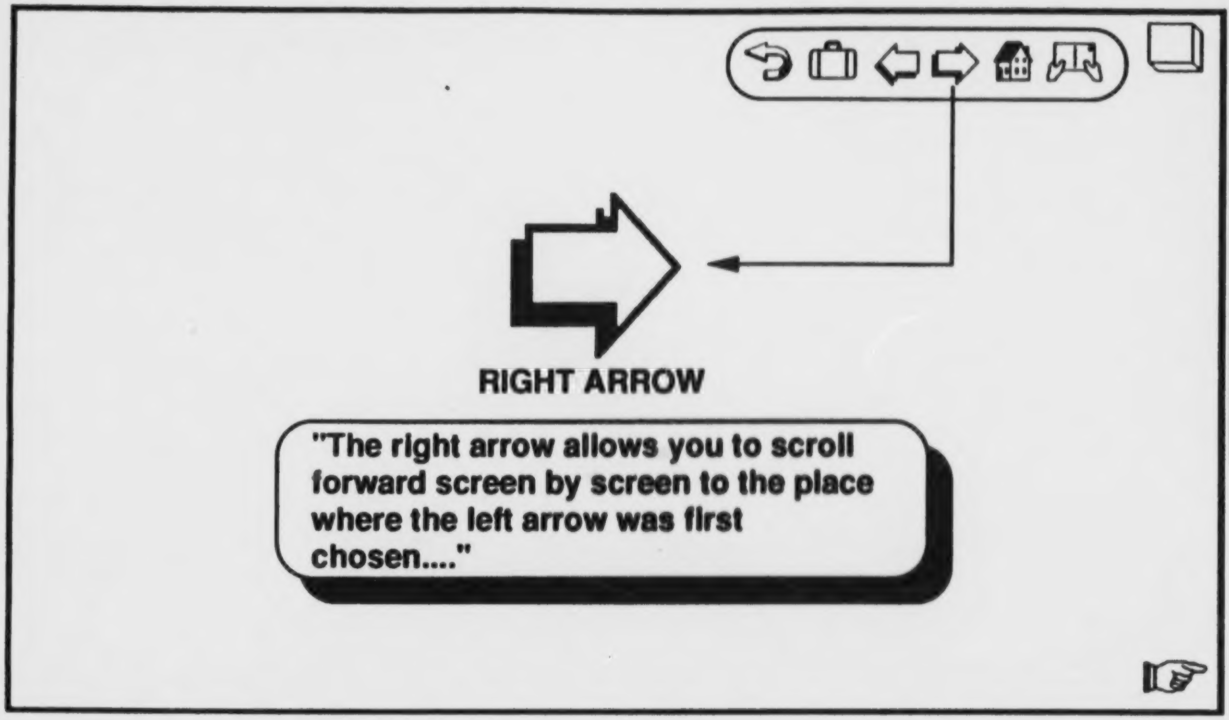
Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:



"The right arrow allows you to scroll forward screen by screen to the place where the left arrow was first chosen...."

Display I.D.

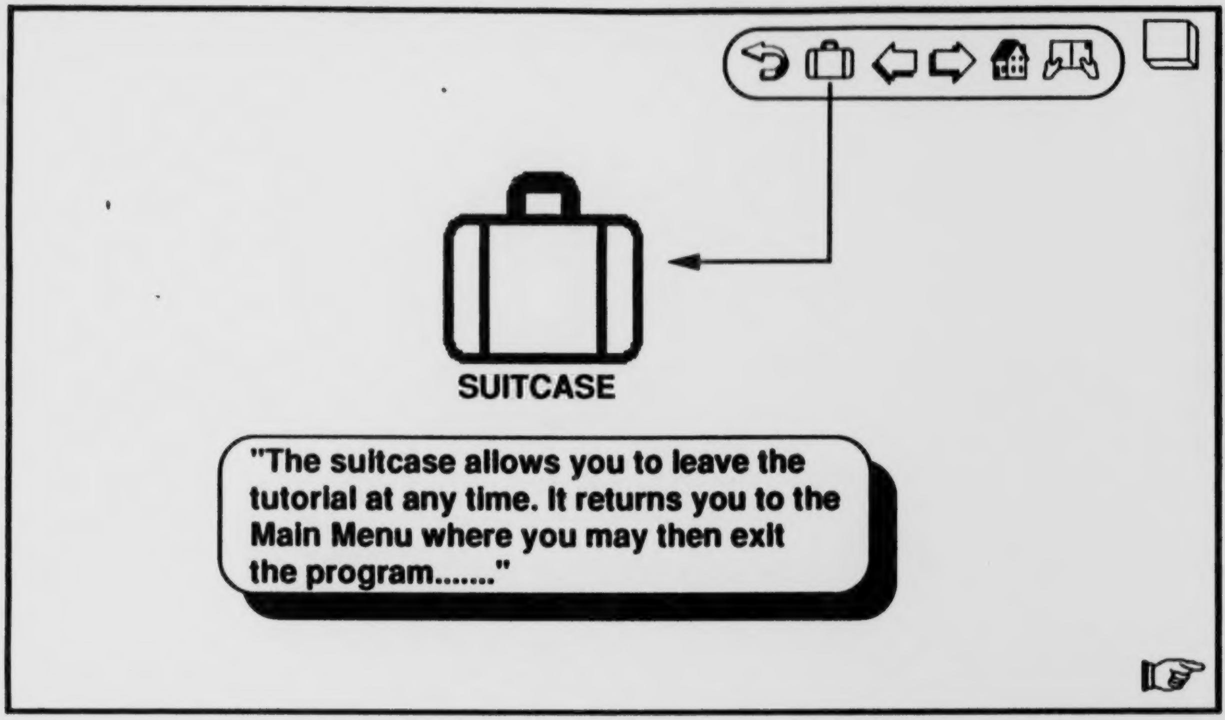
Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:



"The suitcase allows you to leave the tutorial at any time. It returns you to the Main Menu where you may then exit the program......."

Display I.D.

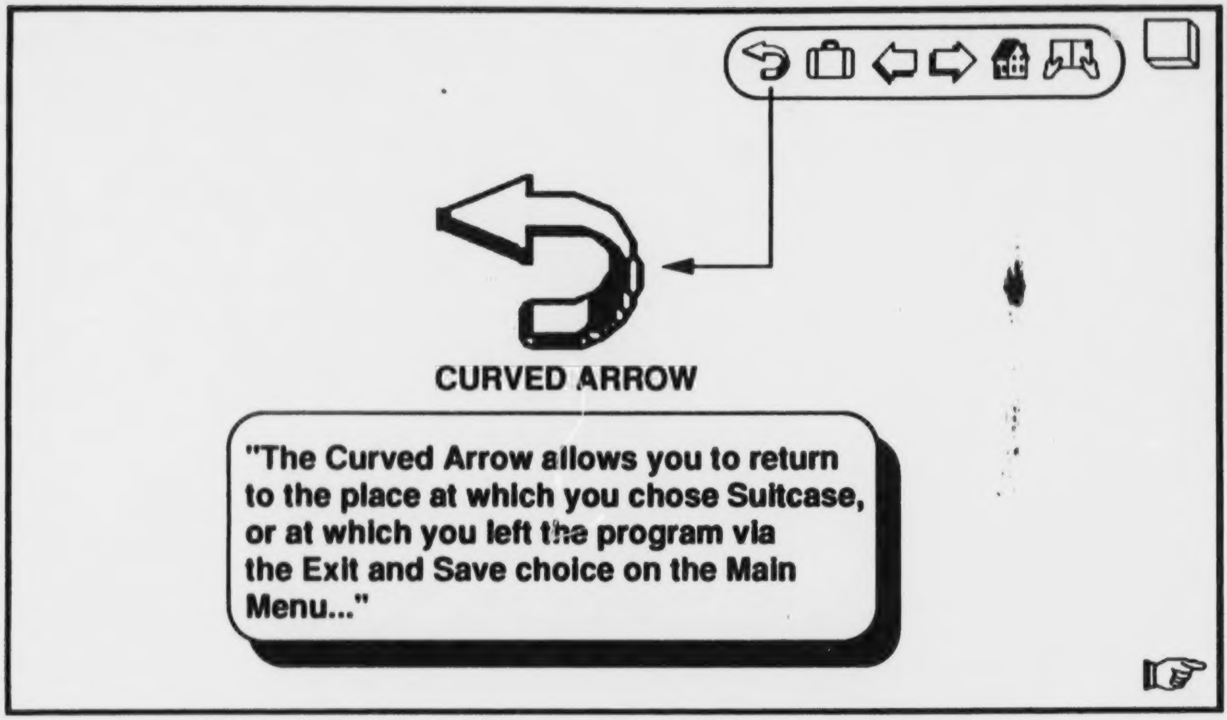
Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:



"The Curved Arrow allows you to return to the place at which you chose Suitcase, or at which you left the program via the Exit and Save choice on the Main Menu..."

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Course:
Type Tutorial

Author:
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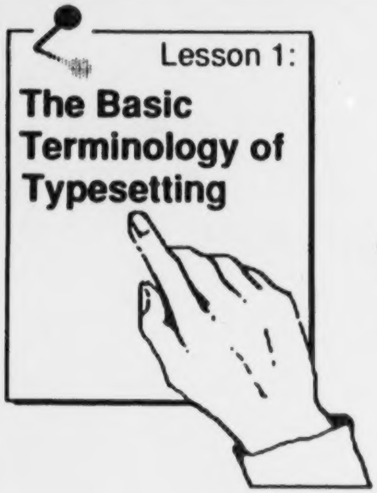
Date:
April 1989

Sequence:

COMMENTS:



Lesson 1:

The Basic Terminology of Typesetting

This lesson will provide an understanding of the basic terms used in the field of typesetting....

Display I.D.

Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:

After completing this lesson you will be able to:

- *define the difference between type, typeface and font*
- *indentify the key variables in typeset documents*
- *state the use, function and relationship of units of measurement and spacing values*

The Basic Terminology
2.

Display I.D.

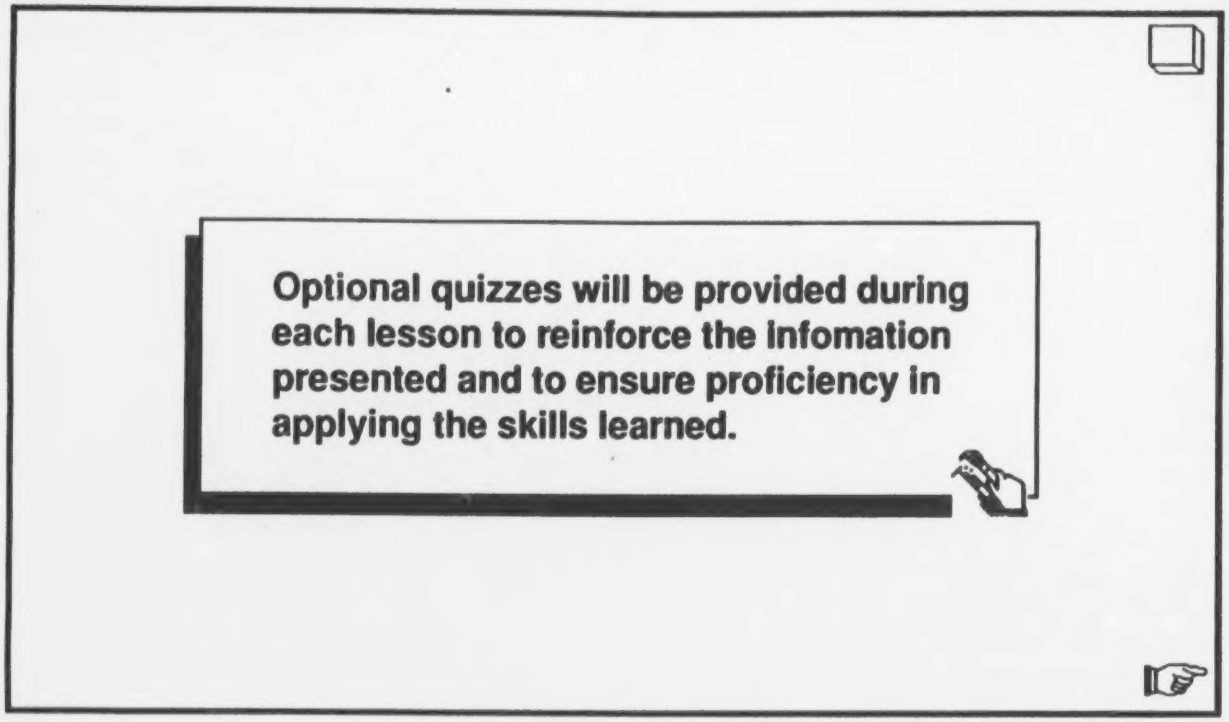
Course:
Type Tutorial

Author:
Andrew Gelland

Date:
April 1989

Sequence:

COMMENTS:



Optional quizzes will be provided during each lesson to reinforce the infomation presented and to ensure proficiency in applying the skills learned.

Display I.D.
Course Objectives

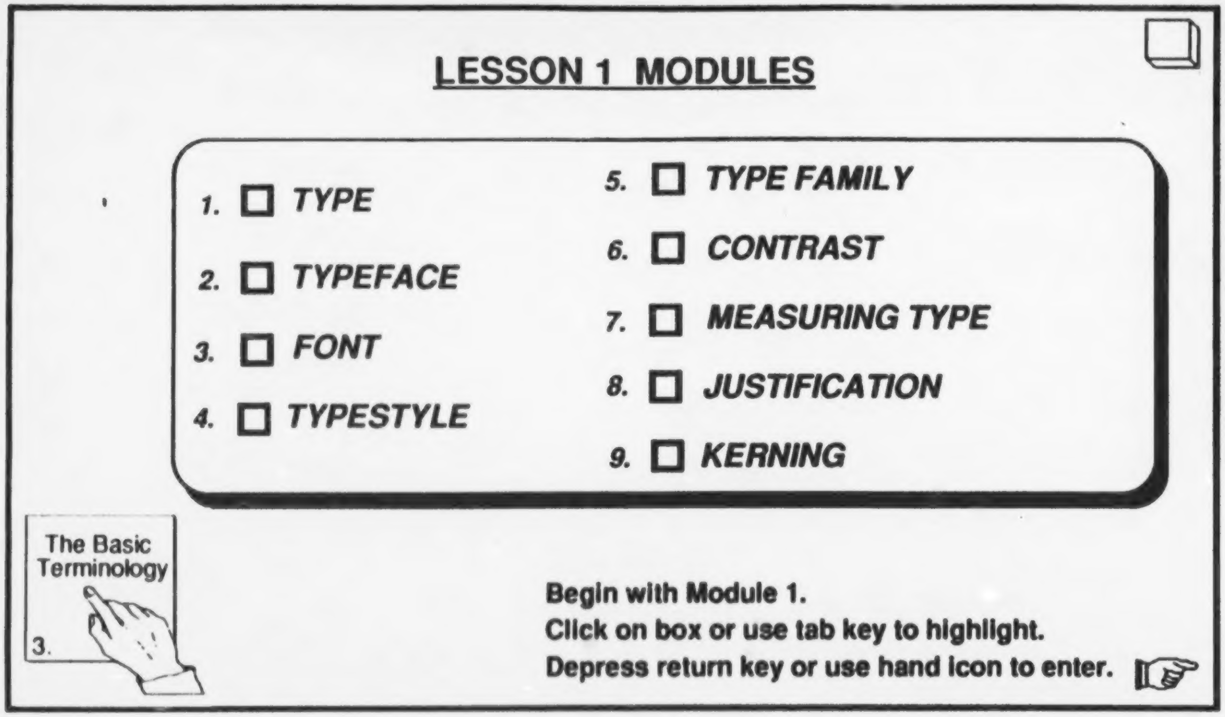
Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:



LESSON 1 MODULES

1. ☐ TYPE
2. ☐ TYPEFACE
3. ☐ FONT
4. ☐ TYPESTYLE
5. ☐ TYPE FAMILY
6. ☐ CONTRAST
7. ☐ MEASURING TYPE
8. ☐ JUSTIFICATION
9. ☐ KERNING

Begin with Module 1.
Click on box or use tab key to highlight.
Depress return key or use hand icon to enter.

Display I.D.

Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:

Module 1

TYPE

"The word type comes from the Greek word *Typos* which means 'letterform'. It refers to the letters of the alphabet and any other elements used to create words, sentences or typographic displays...."

The Basic Terminology

4.

Display I.D.

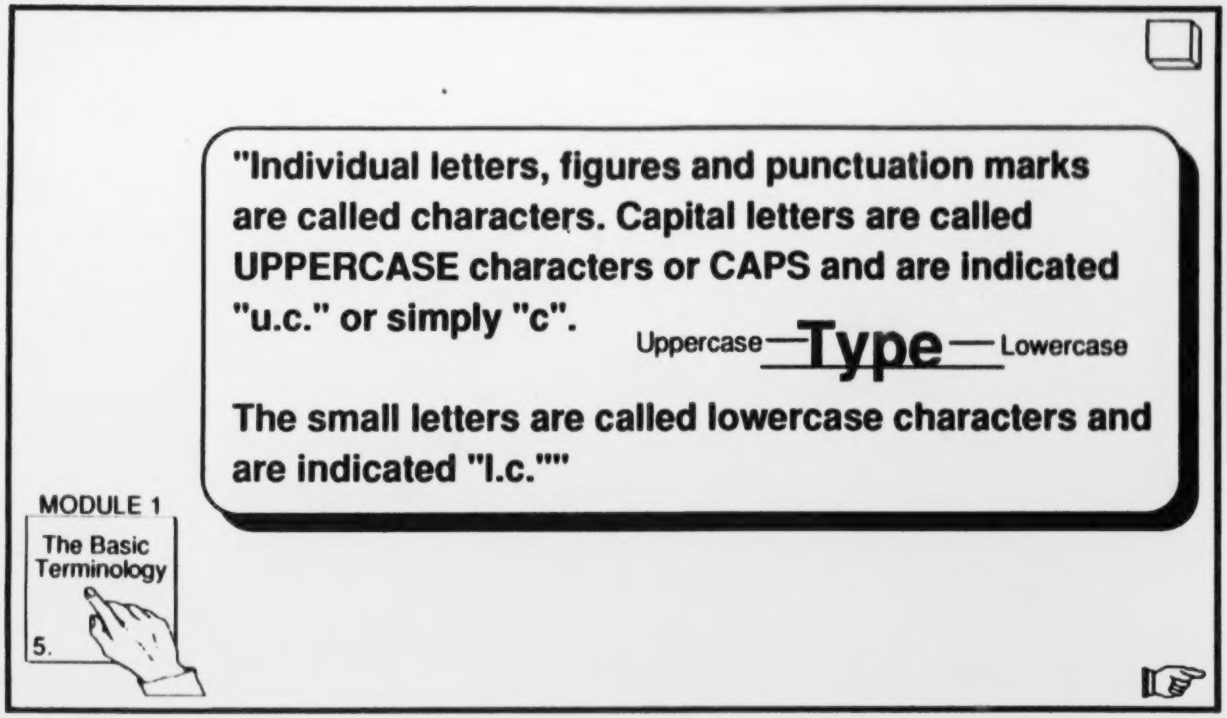
Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:



"Individual letters, figures and punctuation marks are called characters. Capital letters are called UPPERCASE characters or CAPS and are indicated "u.c." or simply "c".

Uppercase—Type—Lowercase

The small letters are called lowercase characters and are indicated "l.c.""

Display I.D.

Course:
Type Tutorial

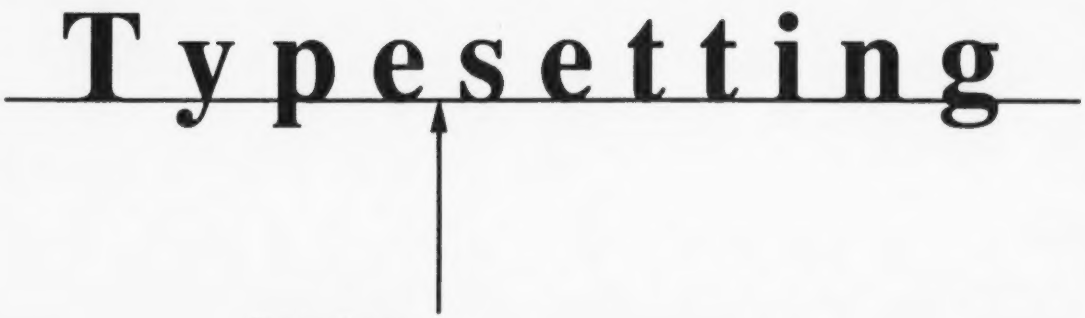
Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:

"Some of the basic terms in typesetting include..............



Baseline:
The line on which all the capitals and most of the lowercase characters appear to stand.

MODULE 1
The Basic Terminology
6.

Display I.D.

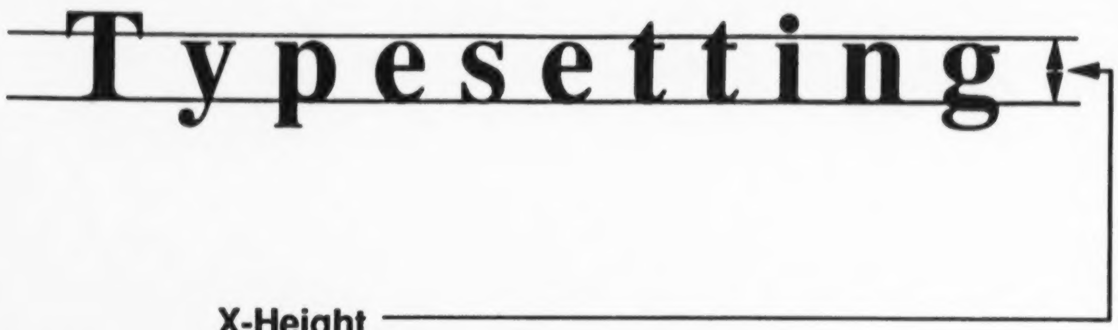
Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

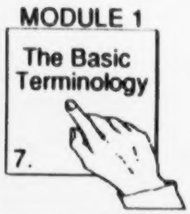
Sequence:

COMMENTS:


Typesetting

X-Height

The height of the body, or main element of the letterform. The x-height is actually the height of the lowercase x.


MODULE 1
The Basic Terminology
7.

Display I.D.

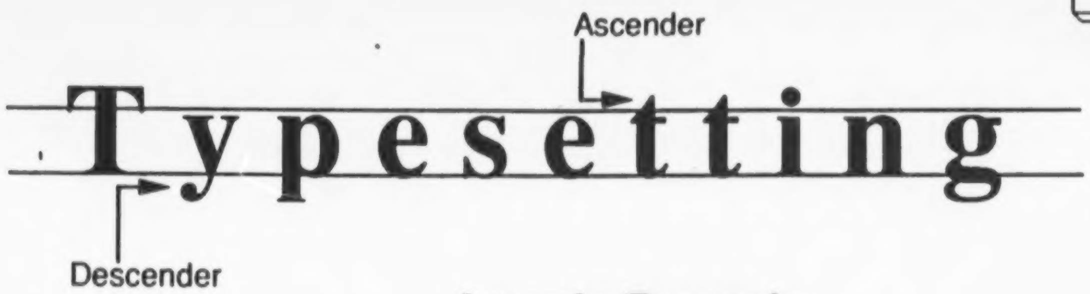
Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:



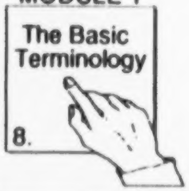
Ascender/Descender

Ascender: The part of the lowercase letter that rises above the x-height. Ascending characters are b,d,f,h,k,l and t.

Descender: The part of the lowercase letter that falls below the baseline. Descending characters are g,j,p,q, and y.

MODULE 1

The Basic Terminology



Display I.D.

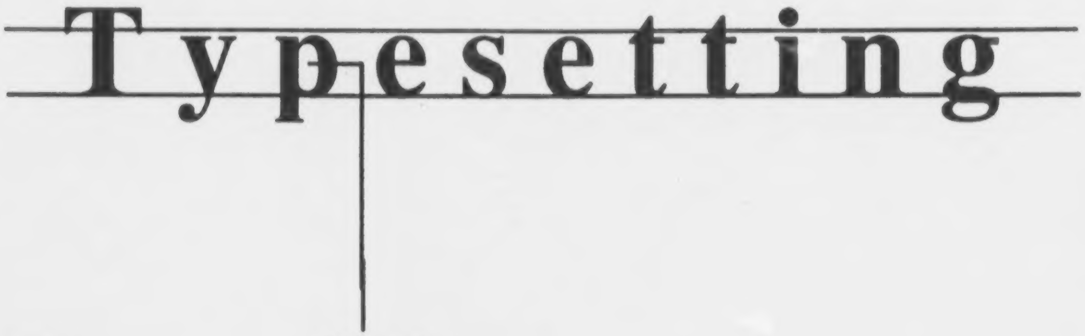
Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:


Typesetting

MODULE 1

The Basic Terminology
9.

Counter

The enclosed or hollow part of the letterform.

Display I.D.

Course:
Type Tutorial

Author:
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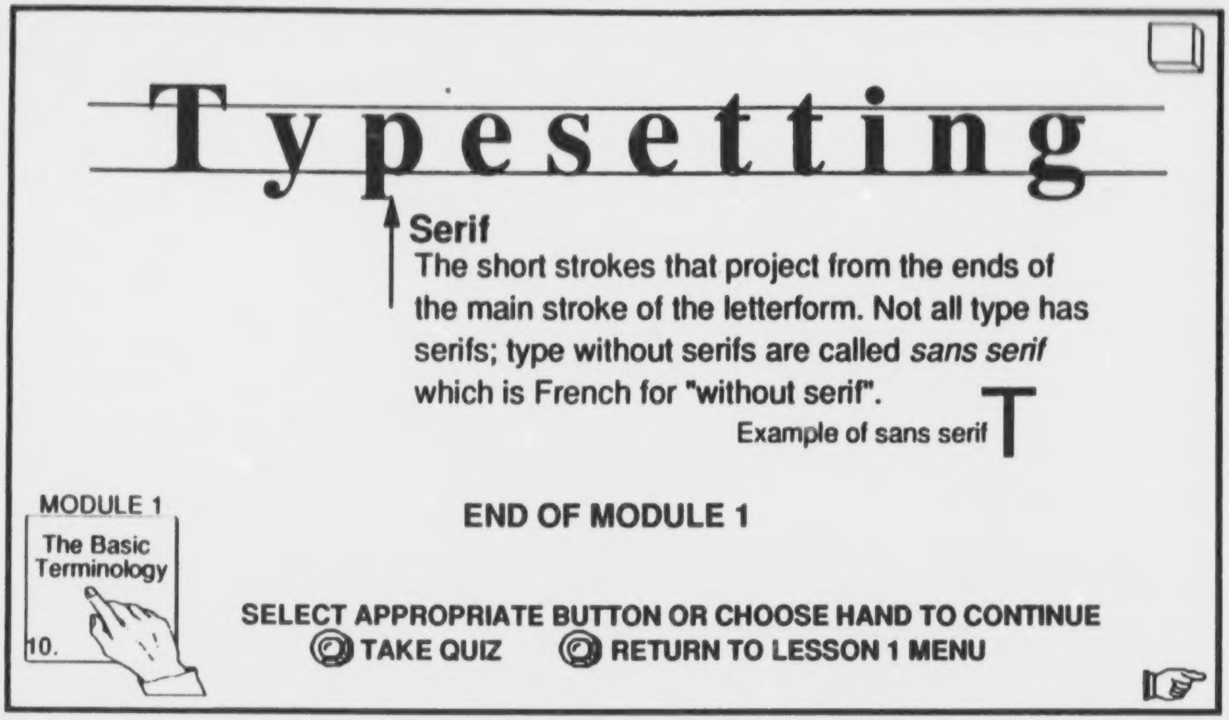
Date:
April 1989

Sequence:

COMMENTS:


Typesetting

Serif

The short strokes that project from the ends of the main stroke of the letterform. Not all type has serifs; type without serifs are called *sans serif* which is French for "without serif".

Example of sans serif T
MODULE 1
The Basic Terminology
10.

END OF MODULE 1

SELECT APPROPRIATE BUTTON OR CHOOSE HAND TO CONTINUE

◎ **TAKE QUIZ** ◎ **RETURN TO LESSON 1 MENU**

Display I.D.

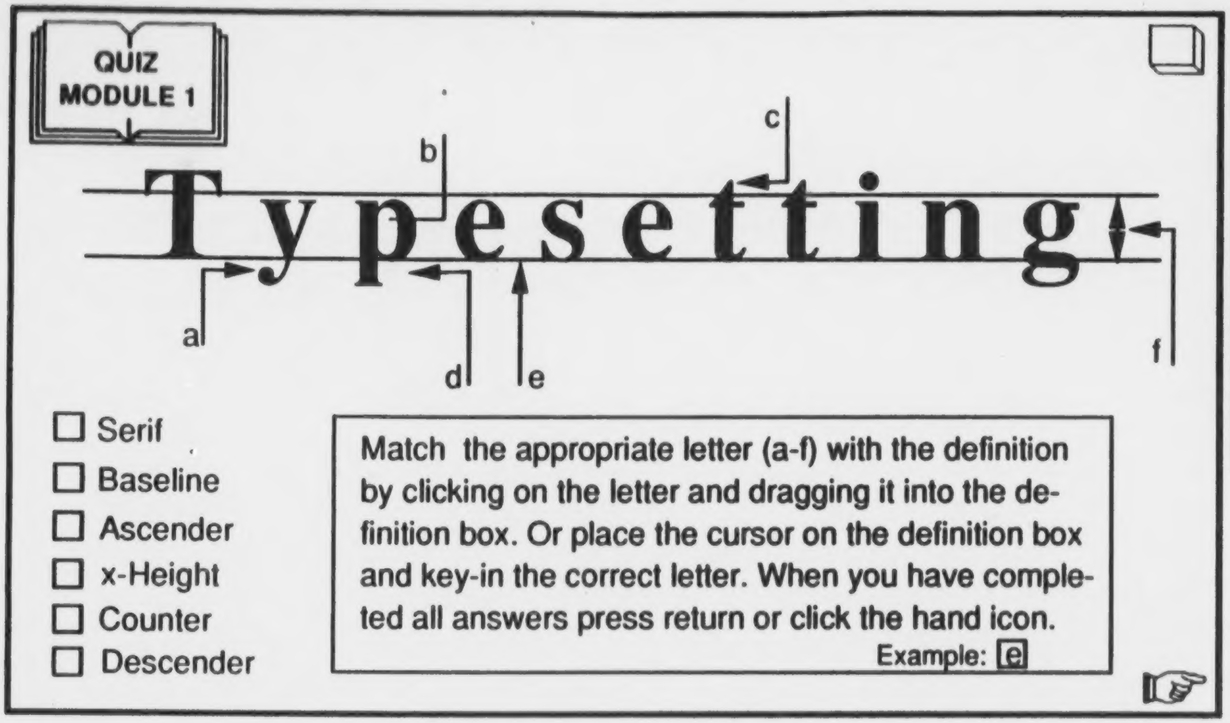
Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:



☐ Serif
☐ Baseline
☐ Ascender
☐ x-Height
☐ Counter
☐ Descender

Match the appropriate letter (a-f) with the definition by clicking on the letter and dragging it into the definition box. Or place the cursor on the definition box and key-in the correct letter. When you have completed all answers press return or click the hand icon.

Example: e

Display I.D.

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Type Tutorial

Author:
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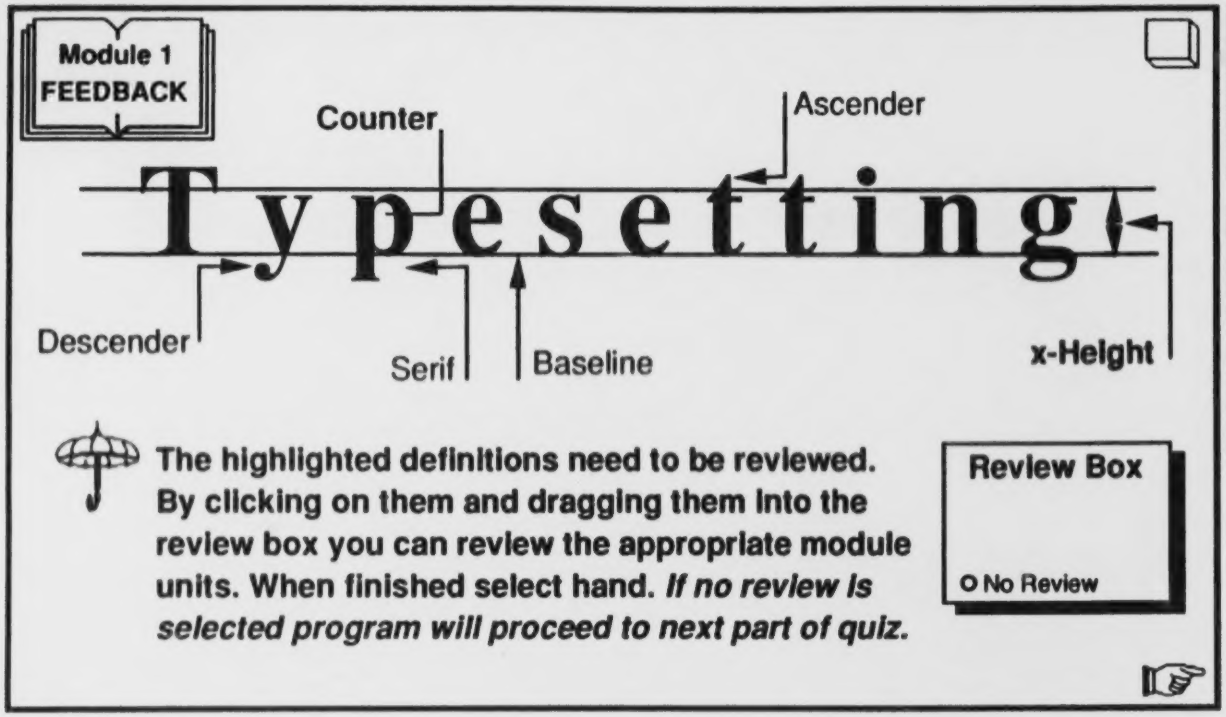
Sequence:

COMMENTS:


Module 1
FEEDBACK
Counter
Ascender
Typesetting
Descender
Serif
Baseline
x-Height
Review Box
○ No Review

The highlighted definitions need to be reviewed. By clicking on them and dragging them into the review box you can review the appropriate module units. When finished select hand. *If no review is selected program will proceed to next part of quiz.*

Display I.D.

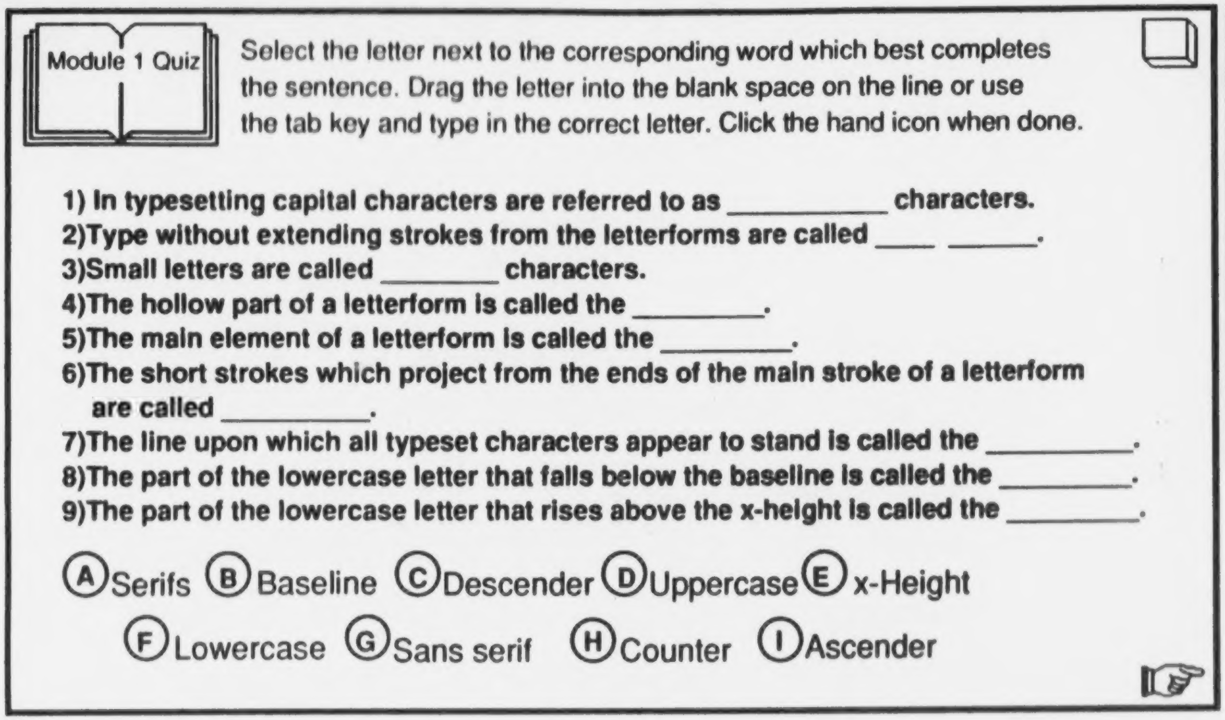
Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:



Module 1 Quiz

Select the letter next to the corresponding word which best completes the sentence. Drag the letter into the blank space on the line or use the tab key and type in the correct letter. Click the hand icon when done.

1) In typesetting capital characters are referred to as __________ characters.
2)Type without extending strokes from the letterforms are called ____ ______.
3)Small letters are called ________ characters.
4)The hollow part of a letterform is called the ________.
5)The main element of a letterform is called the ________.
6)The short strokes which project from the ends of the main stroke of a letterform are called __________.
7)The line upon which all typeset characters appear to stand is called the _________.
8)The part of the lowercase letter that falls below the baseline is called the _________.
9)The part of the lowercase letter that rises above the x-height is called the _________.

Ⓐ Serifs Ⓑ Baseline Ⓒ Descender Ⓓ Uppercase Ⓔ x-Height
Ⓕ Lowercase Ⓖ Sans serif Ⓗ Counter Ⓘ Ascender

Display I.D.

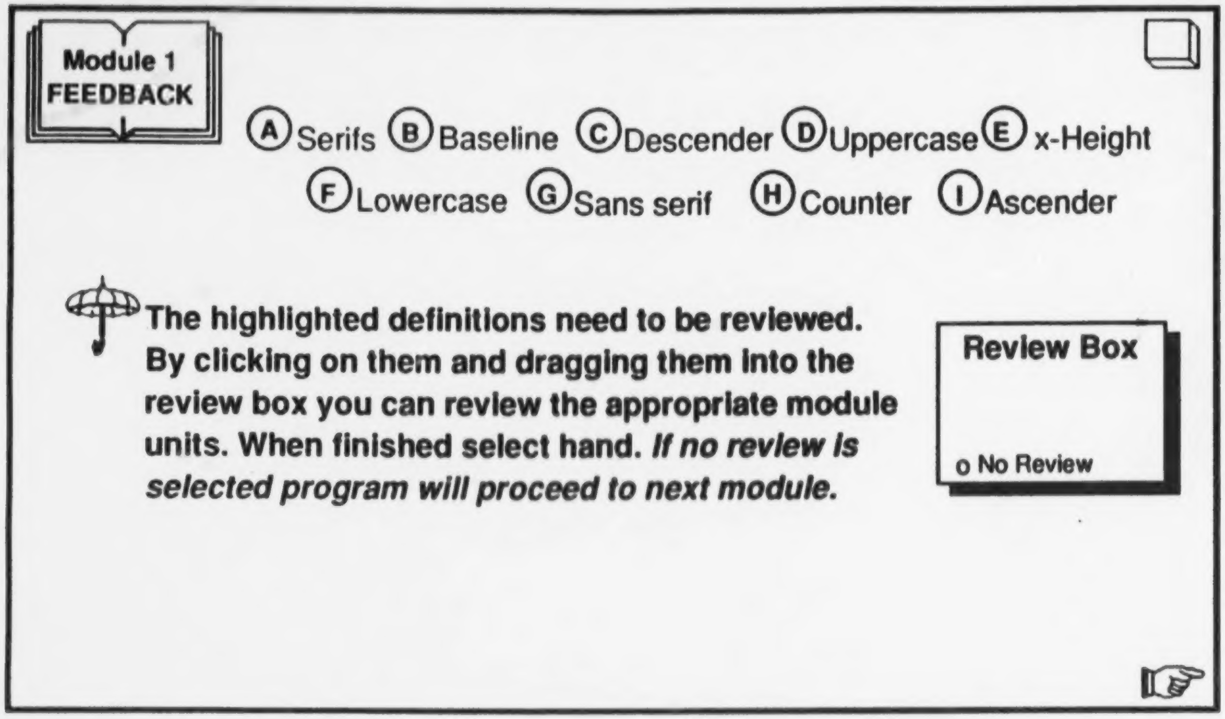
Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:



Module 1 FEEDBACK

Ⓐ Serifs Ⓑ Baseline Ⓒ Descender Ⓓ Uppercase Ⓔ x-Height
Ⓕ Lowercase Ⓖ Sans serif Ⓗ Counter Ⓘ Ascender

The highlighted definitions need to be reviewed. By clicking on them and dragging them into the review box you can review the appropriate module units. When finished select hand. *If no review is selected program will proceed to next module.*

Review Box

○ No Review

Display I.D.

Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:

MODULE 2

TYPEFACE

☐

A *typeface* is a specific design of an alphabet--and there are thousands. The difference between one typeface and another is often very subtle; it may be no more than the shape of the serif, the length of the descenders or ascenders, or the size of the x-Height. Regardless of the difference, the typeface, and therefore the appearance of the entire printed page will be affected.

The Basic Terminology
1.

☞

Display I.D.

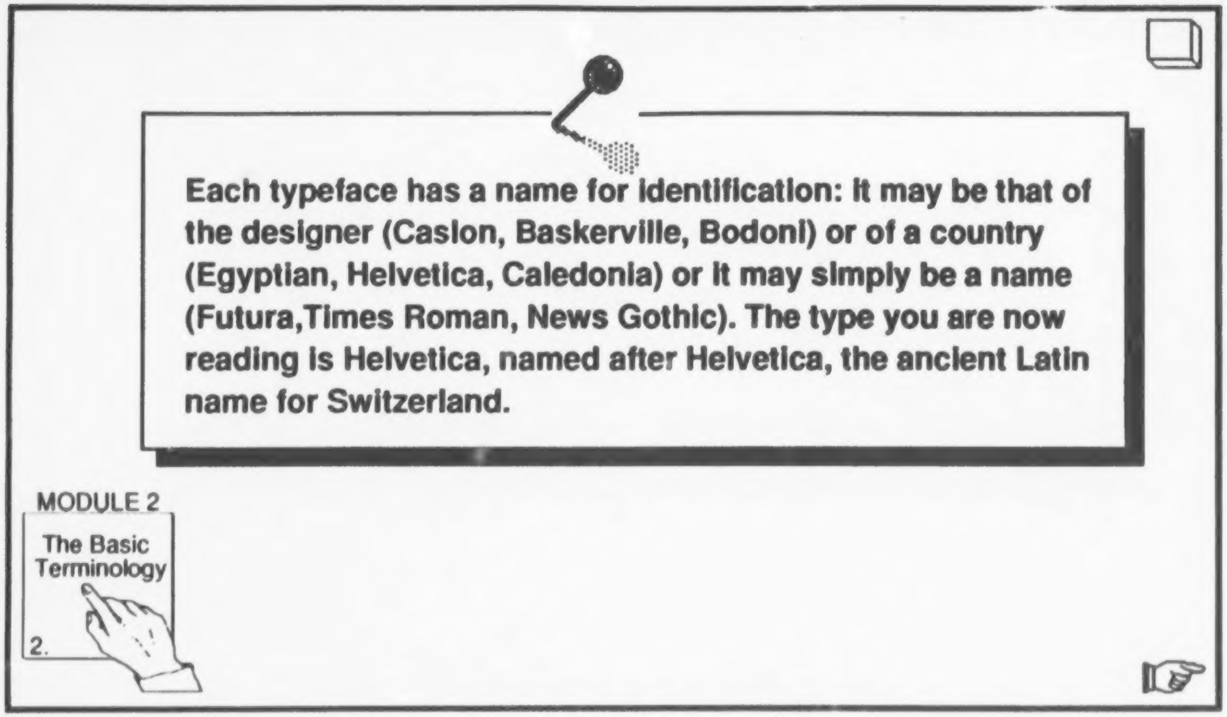
Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:



Each typeface has a name for identification: it may be that of the designer (Caslon, Baskerville, Bodoni) or of a country (Egyptian, Helvetica, Caledonia) or it may simply be a name (Futura,Times Roman, News Gothic). The type you are now reading is Helvetica, named after Helvetica, the ancient Latin name for Switzerland.

Display I.D.

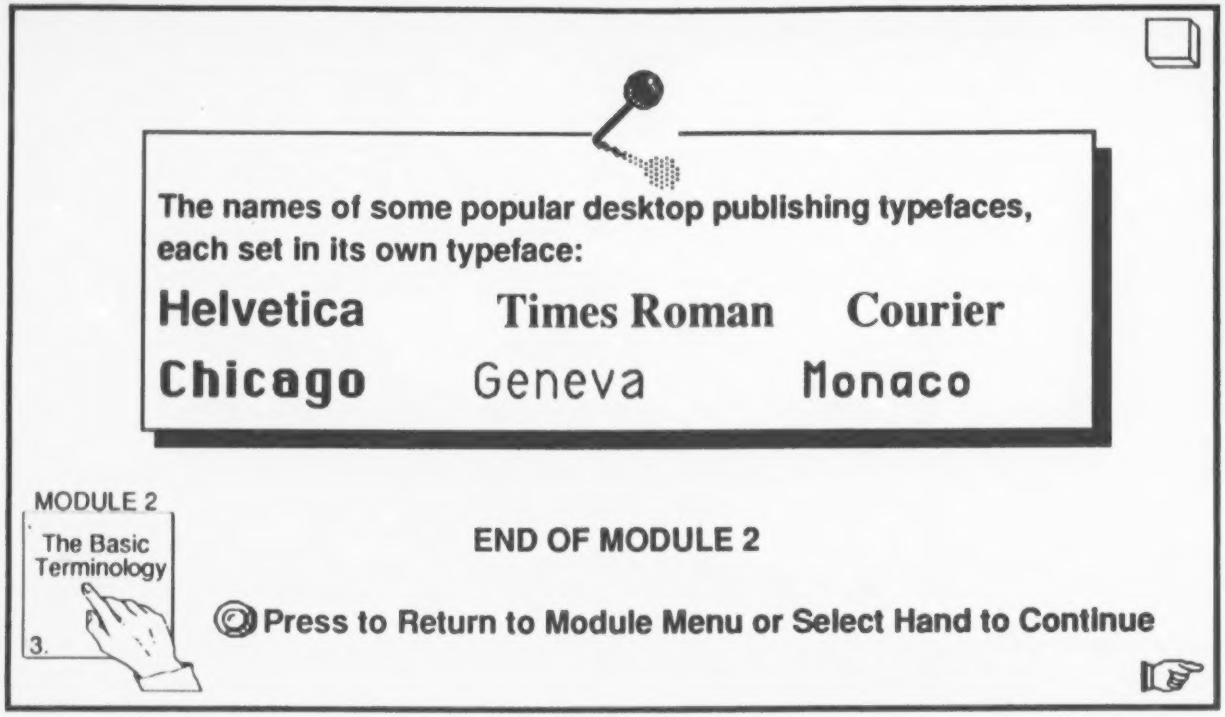
Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:



The names of some popular desktop publishing typefaces, each set in its own typeface:

Helvetica	Times Roman	Courier
Chicago	Geneva	Monaco

END OF MODULE 2

Press to Return to Module Menu or Select Hand to Continue

Display I.D.

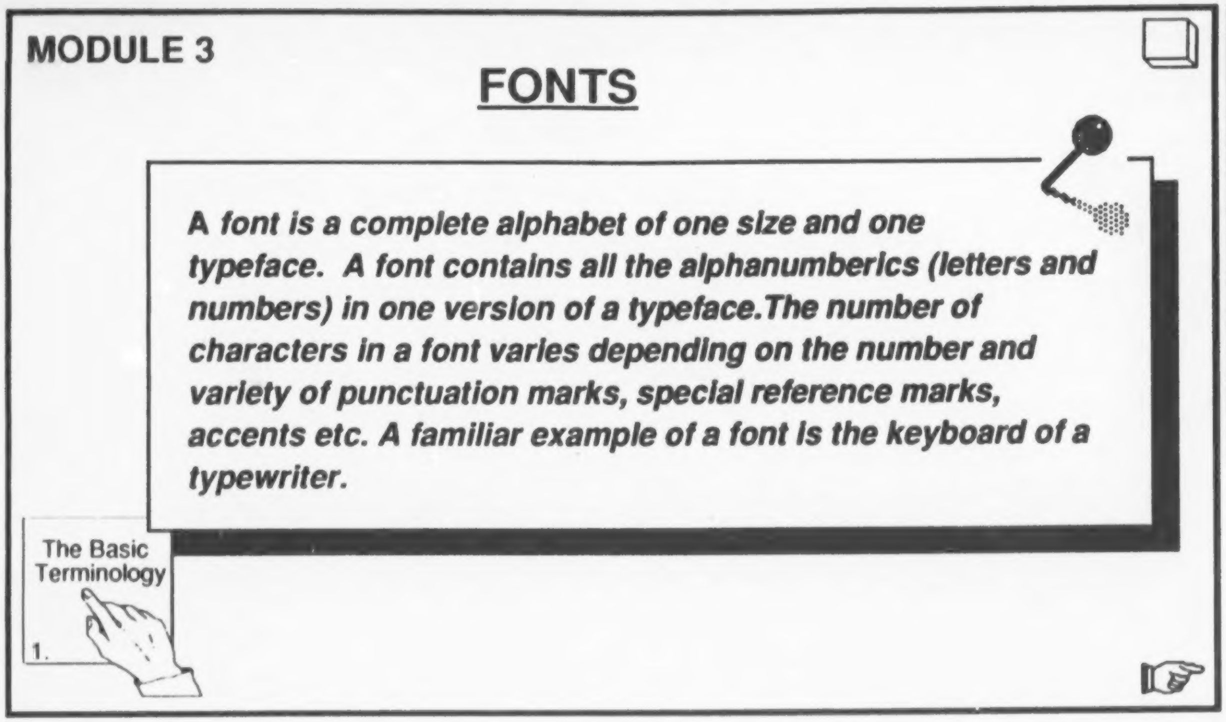
Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:



MODULE 3

FONTS

A font is a complete alphabet of one size and one typeface. A font contains all the alphanumberics (letters and numbers) in one version of a typeface.The number of characters in a font varies depending on the number and variety of punctuation marks, special reference marks, accents etc. A familiar example of a font is the keyboard of a typewriter.

Display I.D.

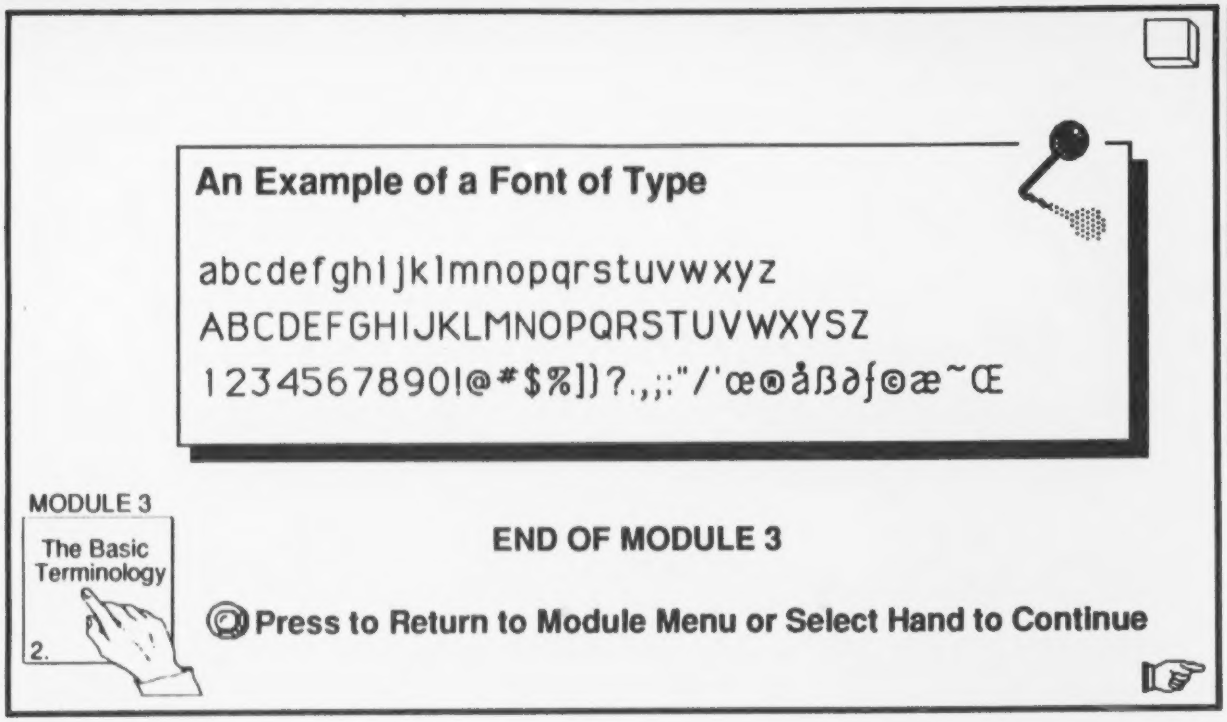
Course: Type Tutorial

Author: Andrew Gelfand

Date: April 1989

Sequence:

COMMENTS:


MODULE 3
The Basic Terminology
2.

An Example of a Font of Type

abcdefghijklmnopqrstuvwxyz
ABCDEFGHIJKLMNOPQRSTUVWXYSZ
1234567890!@#$%])?.,;:"/'œ®åß∂ƒ©æ~Œ

END OF MODULE 3

Press to Return to Module Menu or Select Hand to Continue

Display I.D.

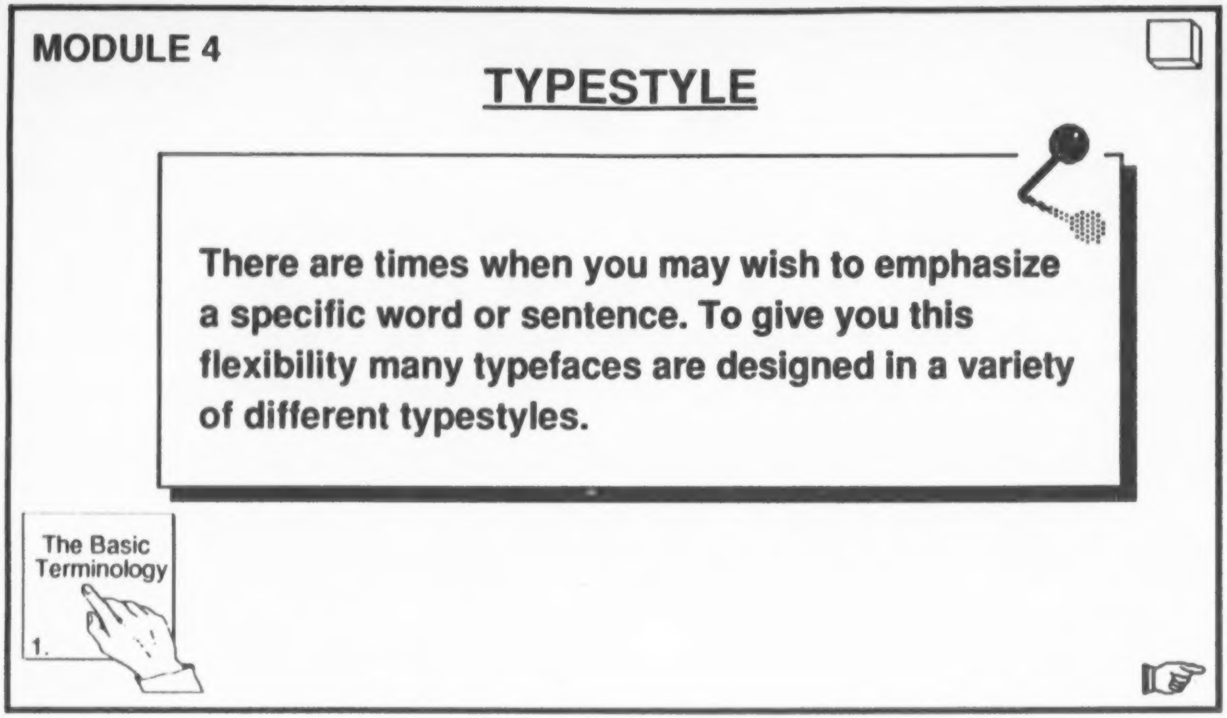
Course: Type Tutorial

Author: Andrew Gelfand

Date: April 1989

Sequence:

COMMENTS:



MODULE 4

TYPESTYLE

There are times when you may wish to emphasize a specific word or sentence. To give you this flexibility many typefaces are designed in a variety of different typestyles.

Display I.D.

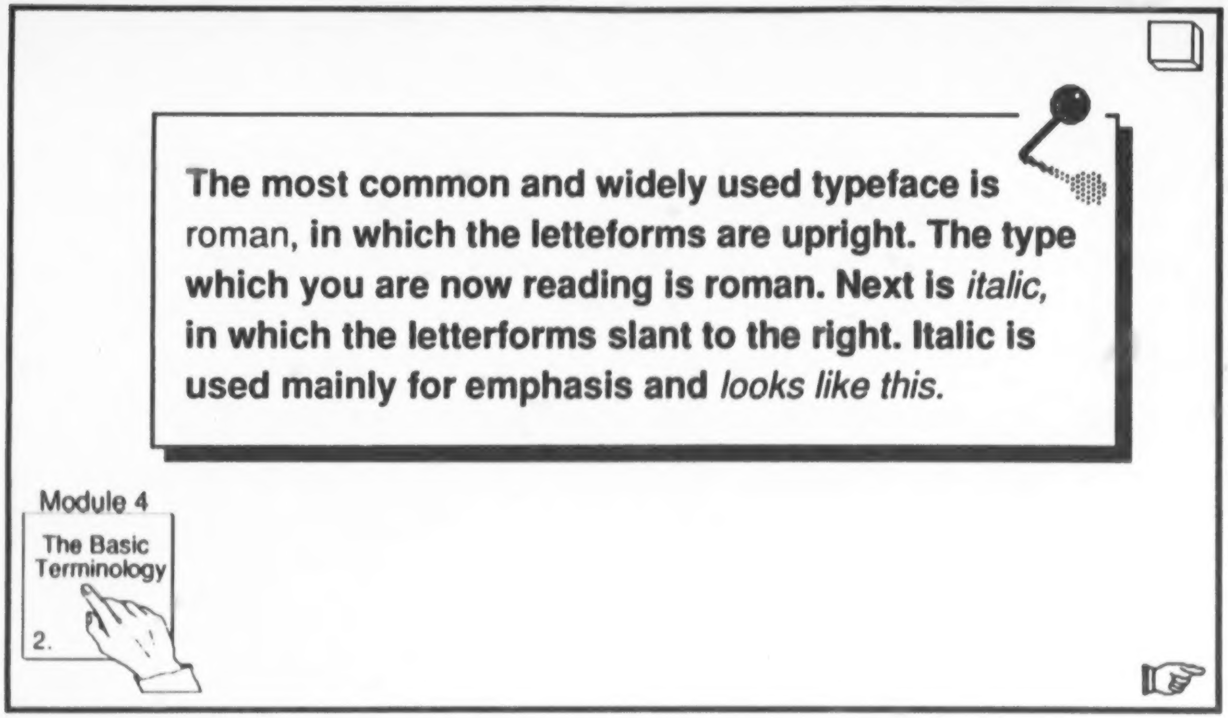
Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:



The most common and widely used typeface is roman, **in which the letteforms are upright. The type which you are now reading is roman. Next is** ***italic,*** **in which the letterforms slant to the right. Italic is used mainly for emphasis and** *looks like this.*

Display I.D.

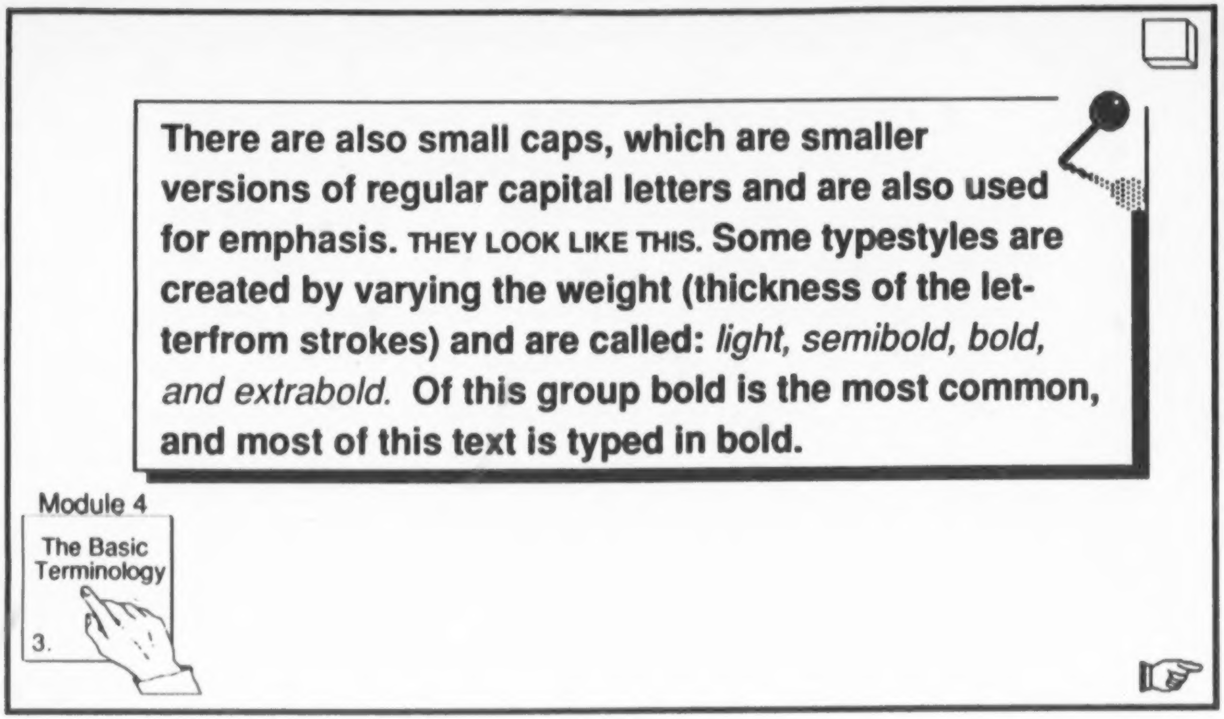
Course: Type Tutorial

Author: Andrew Gelfand

Date: April 1989

Sequence:

COMMENTS:



There are also small caps, which are smaller versions of regular capital letters and are also used for emphasis. THEY LOOK LIKE THIS. Some typestyles are created by varying the weight (thickness of the letterfrom strokes) and are called: *light, semibold, bold, and extrabold.* Of this group bold is the most common, and most of this text is typed in bold.

Display I.D.

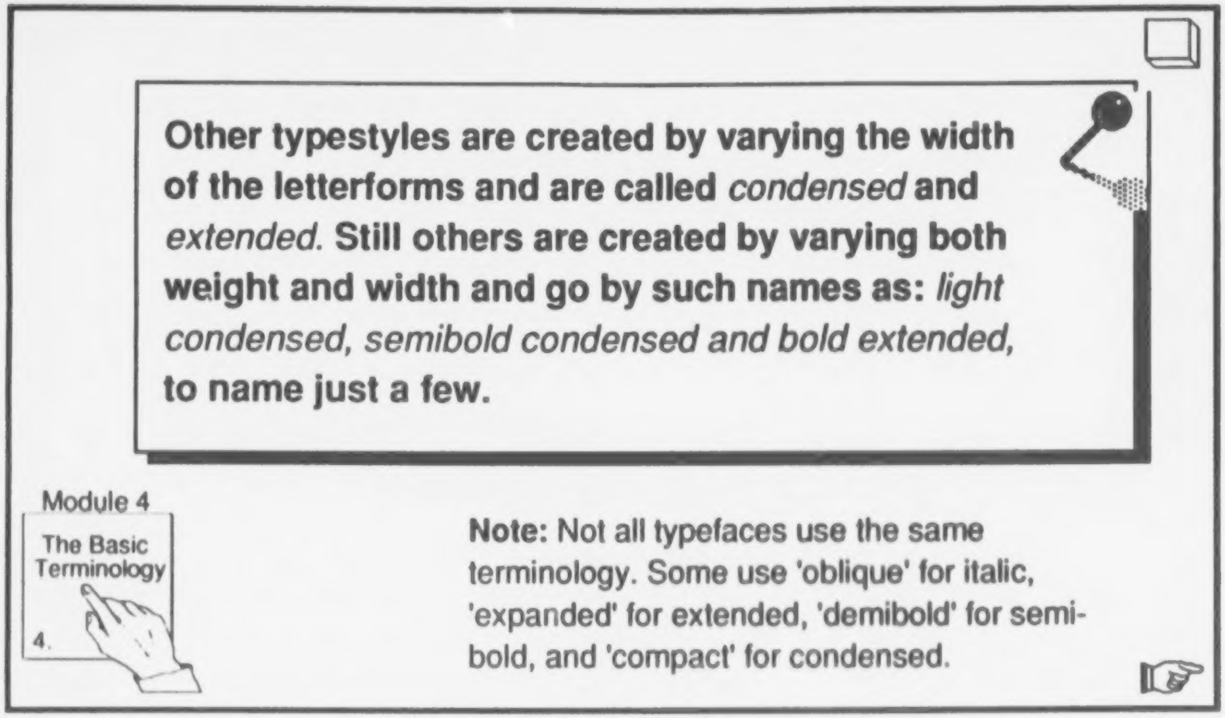
Course: Type Tutorial

Author: Andrew Gelfand

Date: April 1989

Sequence:

COMMENTS:



Other typestyles are created by varying the width of the letterforms and are called *condensed* **and** *extended.* **Still others are created by varying both weight and width and go by such names as:** *light condensed, semibold condensed and bold extended,* **to name just a few.**

Module 4

The Basic Terminology

4.

Note: Not all typefaces use the same terminology. Some use 'oblique' for italic, 'expanded' for extended, 'demibold' for semibold, and 'compact' for condensed.

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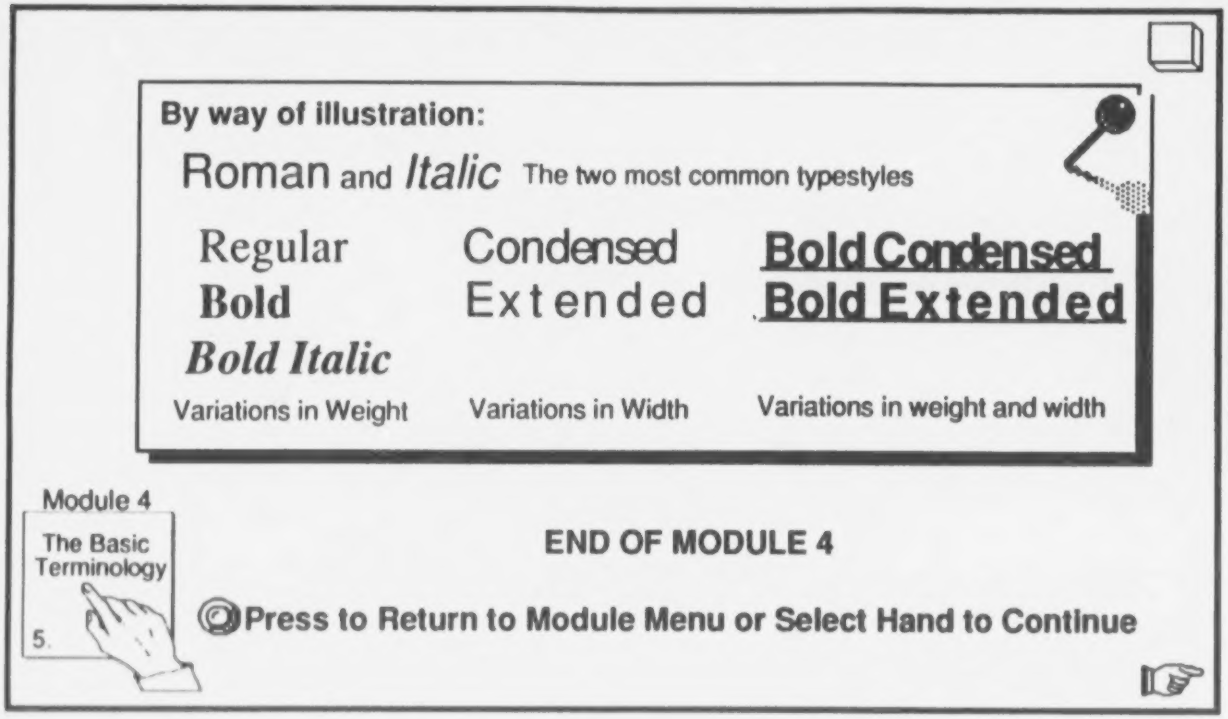
Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:



By way of illustration:

Roman and *Italic* The two most common typestyles

Variations in Weight	Variations in Width	Variations in weight and width
Regular	Condensed	**Bold Condensed**
Bold	Extended	**Bold Extended**
Bold Italic		

END OF MODULE 4

◎ **Press to Return to Module Menu or Select Hand to Continue**

Display I.D.

Course: Type Tutorial

Author: Andrew Gelfand

Date: April 1989

Sequence:

COMMENTS:

MODULE 5

TYPE FAMILY

- If we combine all the styles and all the sizes of a given typeface we have what is called a family of type.
- Using typestyles from within the same family gives a printed piece a unified appearance. This is because all type styles of a given type size have a common family resemblance, as well as the same X-Height, cap height and length of ascenders and descenders.

The Basic Terminology
1.

Display I.D.

Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:

For example: multiply the following typestyles by all their type sizes and you have the Garmond family of type:

Garamond Light
Garamond Book
Garamond Bold
Garamond Ultra
Garamond Light Italic
Garamond Book Italic
Garamond Bold Italic
Garamond Ultra Italic

MODULE 5

The Basic
Terminology
2.

END OF MODULE 5

◎ Press to Return to Module Menu or Select Hand to Continue ☞

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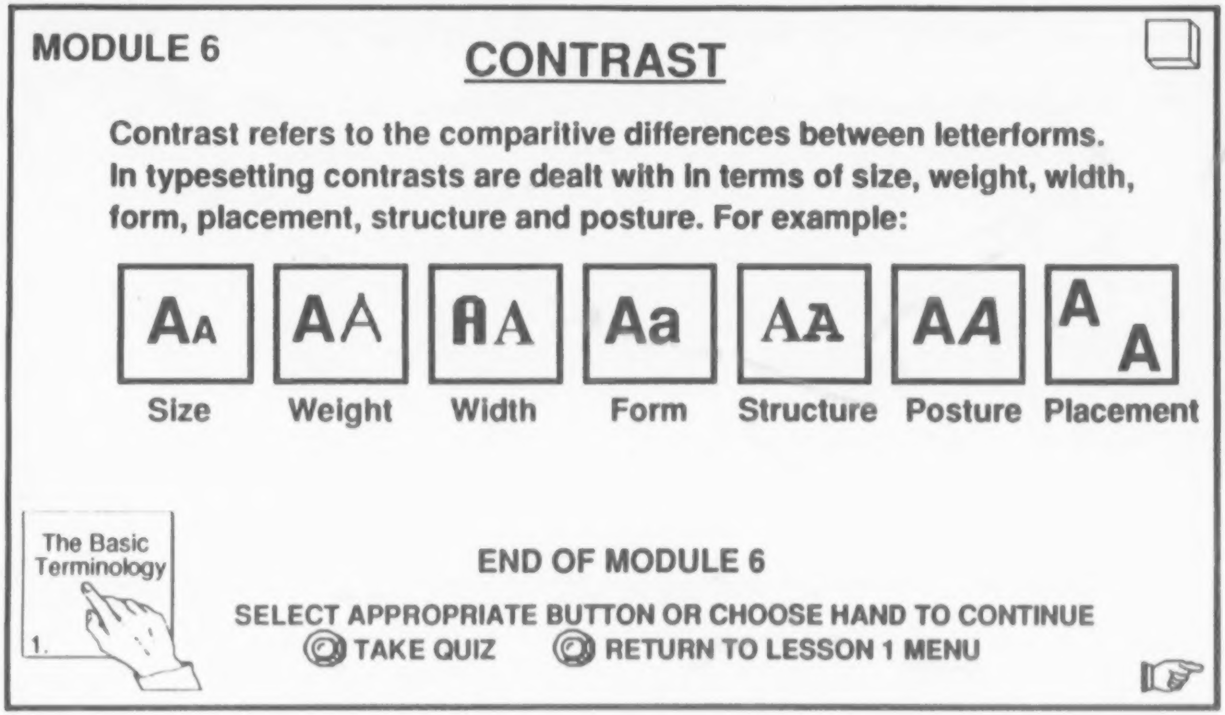
COMMENTS:


AA
Size
AA
Weight
AA
Width
Aa
Form
AA
Structure
AA
Posture
A A
Placement
The Basic Terminology
1.

MODULE 6

CONTRAST

Contrast refers to the comparitive differences between letterforms. In typesetting contrasts are dealt with in terms of size, weight, width, form, placement, structure and posture. For example:

END OF MODULE 6

SELECT APPROPRIATE BUTTON OR CHOOSE HAND TO CONTINUE

◎ TAKE QUIZ ◎ RETURN TO LESSON 1 MENU

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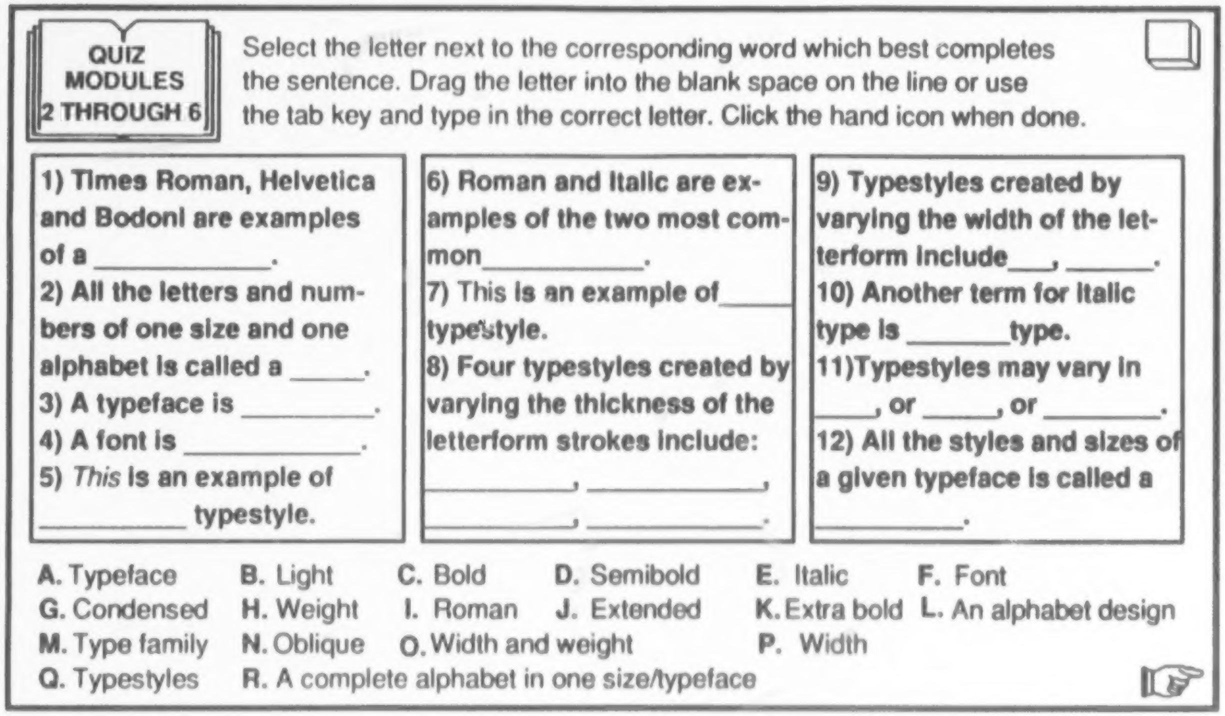
Sequence:

COMMENTS:



Select the letter next to the corresponding word which best completes the sentence. Drag the letter into the blank space on the line or use the tab key and type in the correct letter. Click the hand icon when done.

1) Times Roman, Helvetica and Bodoni are examples of a ____________.

2) All the letters and numbers of one size and one alphabet is called a _____.

3) A typeface is __________.

4) A font is _____________.

5) *This* **is an example of ___________ typestyle.**

6) Roman and Italic are examples of the two most common___________.

7) This **is an example of_____ typestyle.**

8) Four typestyles created by varying the thickness of the letterform strokes include:

__________, ____________,
__________, ____________.

9) Typestyles created by varying the width of the letterform include___, ______.

10) Another term for Italic type is _______type.

11)Typestyles may vary in ____, or _____, or ________.

12) All the styles and sizes of a given typeface is called a __________.

A. Typeface
B. Light
C. Bold
D. Semibold
E. Italic
F. Font
G. Condensed
H. Weight
I. Roman
J. Extended
K. Extra bold
L. An alphabet design
M. Type family
N. Oblique
O. Width and weight
P. Width
Q. Typestyles
R. A complete alphabet in one size/typeface

Display I.D.

Course:
Type Tutorial

Author:
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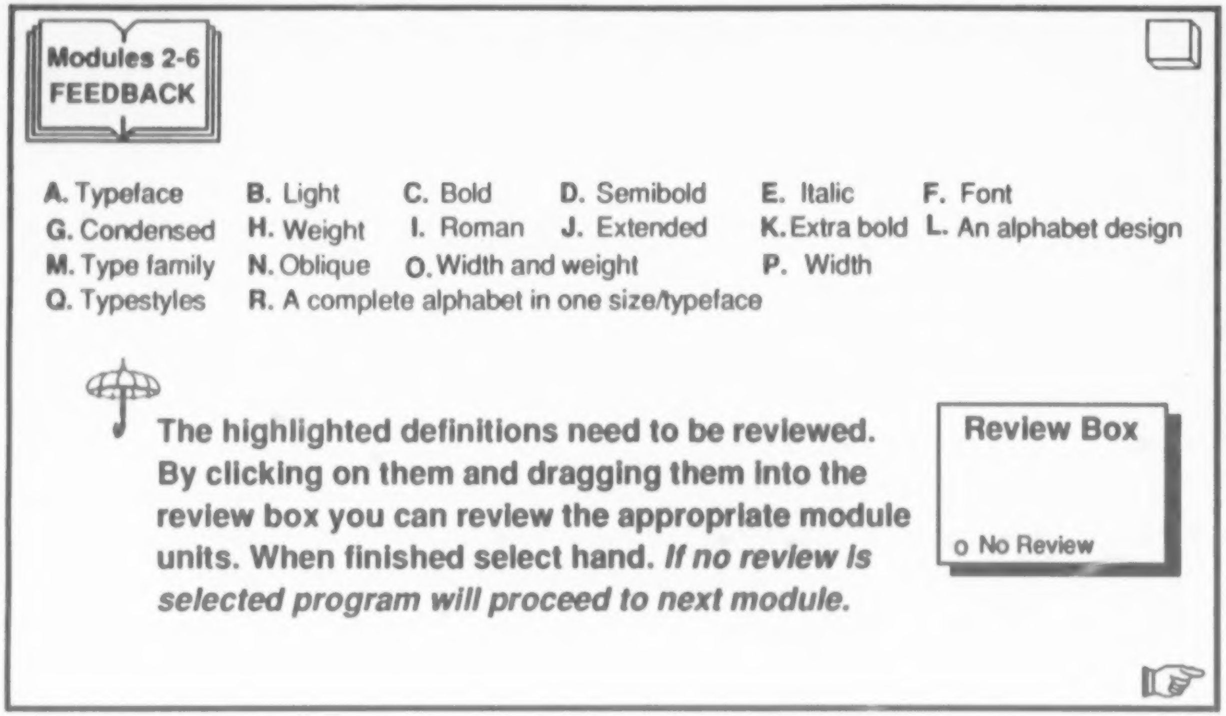
Date:
April 1989

Sequence:

COMMENTS:



Modules 2-6
FEEDBACK

A. Typeface B. Light C. Bold D. Semibold E. Italic F. Font
G. Condensed H. Weight I. Roman J. Extended K. Extra bold L. An alphabet design
M. Type family N. Oblique O. Width and weight P. Width
Q. Typestyles R. A complete alphabet in one size/typeface

The highlighted definitions need to be reviewed. By clicking on them and dragging them into the review box you can review the appropriate module units. When finished select hand. *If no review is selected program will proceed to next module.*

Review Box

○ No Review

Display I.D.

Course:
Type Tutorial

Author:
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Date:
April 1989

Sequence:

COMMENTS:

MODULE 7

MEASURING TYPE

There are three basic type measurements with which you should be familiar: *points, picas and units*. These measurements are to the user of type what inches and feet are to the builder, and it is with these measurements that the user of type controls the appearance of the printed page.

The Basic Terminology

1.

Display I.D.

Course:
Type Tutorial

Author:
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Date:
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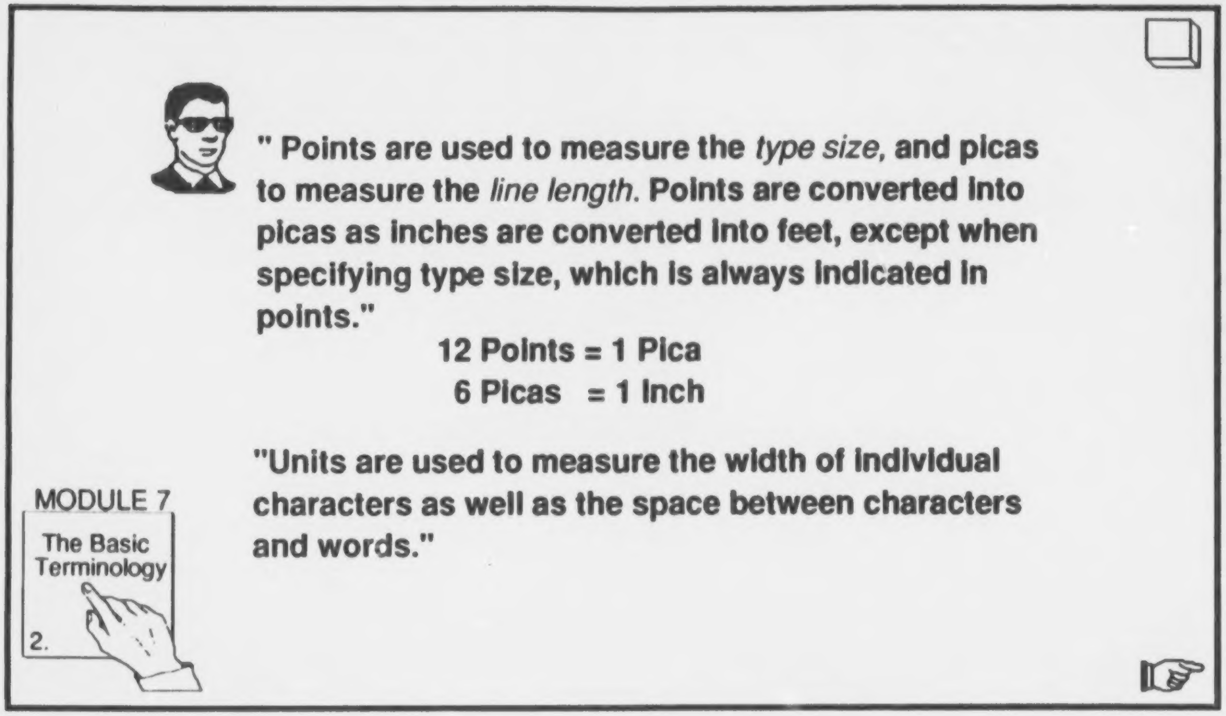
Sequence:

COMMENTS:



" Points are used to measure the *type size*, and picas to measure the *line length*. Points are converted into picas as inches are converted into feet, except when specifying type size, which is always indicated in points."

12 Points = 1 Pica
6 Picas = 1 Inch

"Units are used to measure the width of individual characters as well as the space between characters and words."

Display I.D.

Course: Type Tutorial

Author: Andrew Gelfand

Date: April 1989

Sequence:

COMMENTS:

Points

"....The *point or bodysize* of a typeface is the measurement from the top of the ascender to the to the bottom of the descender with a small amount of space above and below to prevent the lines from touching when typeset."

MODULE 7

The Basic Terminology

3.

Display I.D.

Course:
Type Tutorial

Author:
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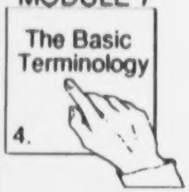
Date:
April 1989

Sequence:

COMMENTS:

" The space above and below each character varies from typeface to typeface and the only certain method of determining the point size of a given type is to compare it with a sample from a type specimen book."

MODULE 7



"Type can also be measured from baseline to baseline, providing that no extra space has been added between lines".

Display I.D.

Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
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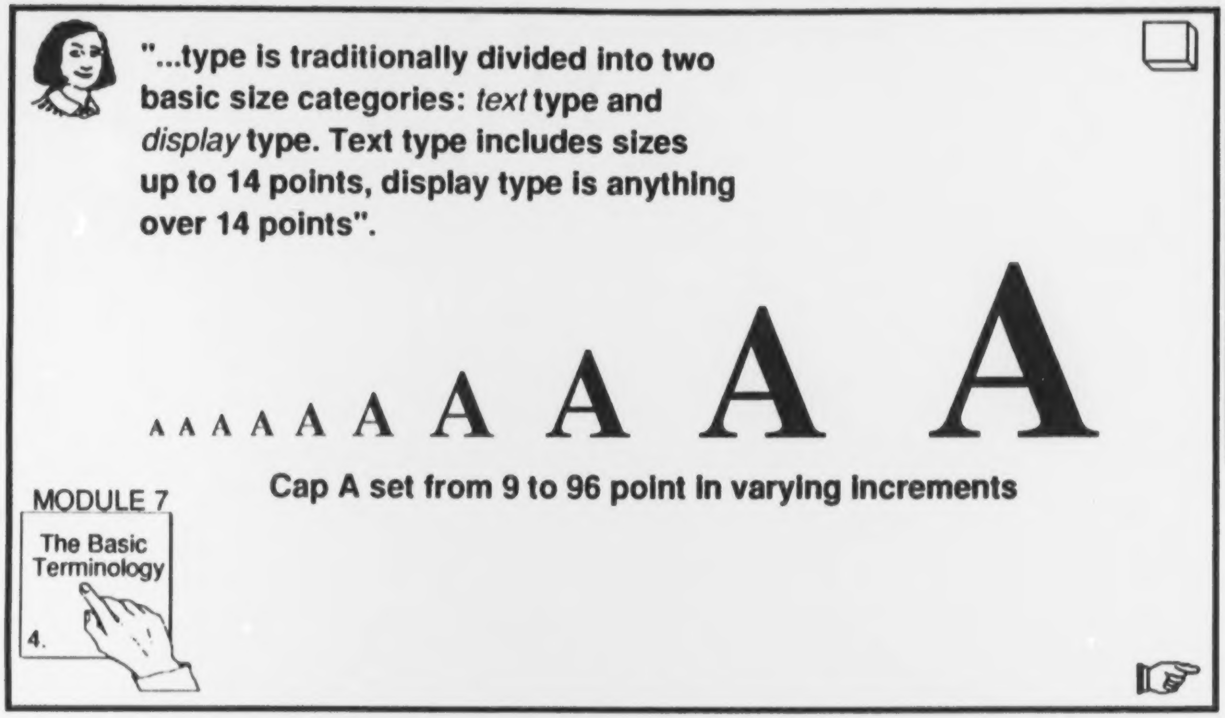
Sequence:

COMMENTS:



"...type is traditionally divided into two basic size categories: *text* type and *display* type. Text type includes sizes up to 14 points, display type is anything over 14 points".

A A A A A A A A A A

Cap A set from 9 to 96 point in varying increments

MODULE 7
The Basic Terminology
4.

Display I.D.

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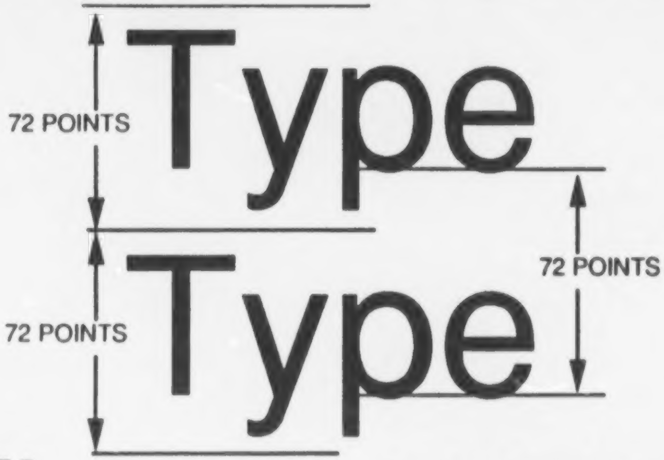
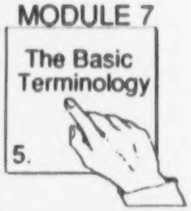
Sequence:

COMMENTS:


72 POINTS
Type
72 POINTS
72 POINTS
Type


MODULE 7
The Basic Terminology
5.

The point size of a typeface is the measurement from the top of the ascender to the bottom of the descender, with a small amount of space above and below. Type can also be measured from baseline to baseline.

Display I.D.

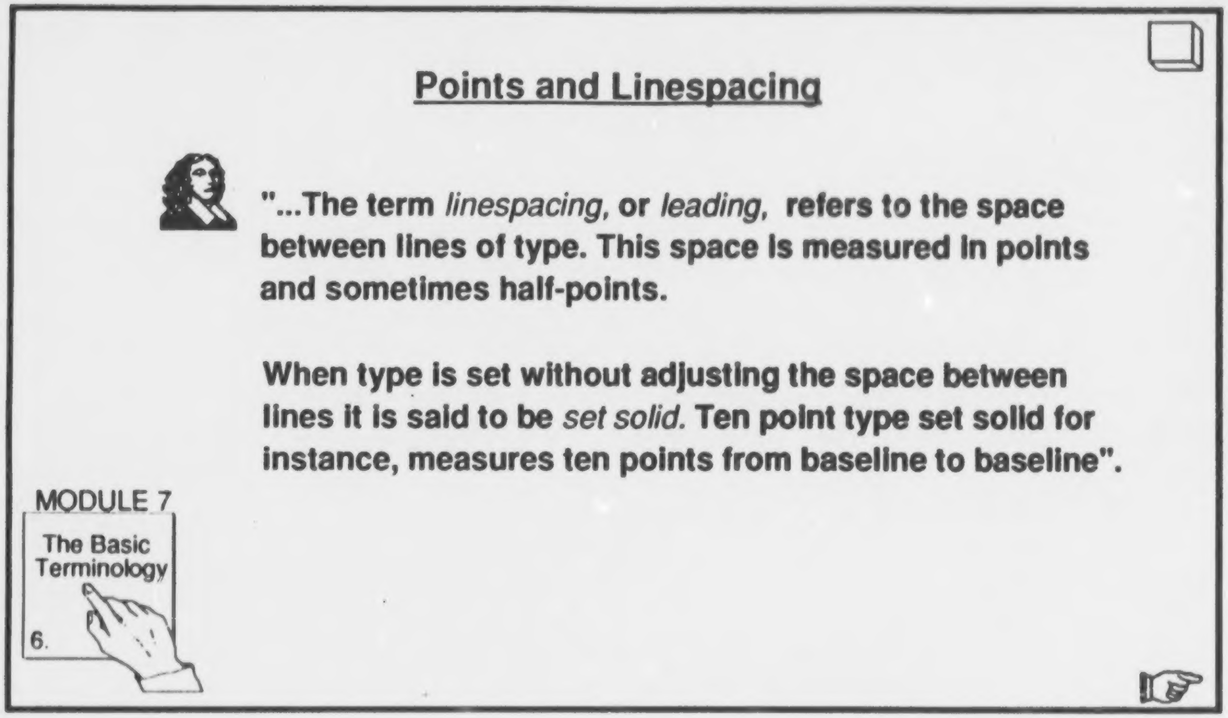
Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:



Points and Linespacing

"...The term *linespacing,* or *leading,* refers to the space between lines of type. This space is measured in points and sometimes half-points.

When type is set without adjusting the space between lines it is said to be *set solid.* Ten point type set solid for instance, measures ten points from baseline to baseline".

Display I.D.

Course:
Type Tutorial

Author:
Andrew Gelfand

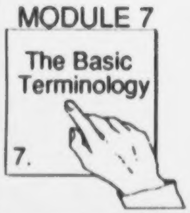
Date:
April 1989

Sequence:

COMMENTS:

"...if we add one point of space between the lines, the type would be set *ten on eleven* (10/11). The first figure represents the type size and the second figure the type-size plus the leading. The second figure also represents the baseline to baseline measurement. The type you are now reading is 12/14 Helvetica bold. That is 12 point type set on 14 point leading."

EXAMPLES:			
	To be or not to be that is the question. Whether tis mobler in the mind to suffer	*To be or not to be that is the question. Whether tis mobler in the mind to suffer*	*To be or not to be that is the question. Whether tis mobler in the mind to suffer*
	10 Point type on 11 Point leading	**10 Point type on 12 Point leading**	**10 Point type on 13 Point leading**



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Course:
Type Tutorial

Author:
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Date:
April 1989

Sequence:

COMMENTS:

Picas

"...Picas are used to indicate the length of the line of measure. The type which you are now reading was set to a maximum measure of 24 picas or four inches. Picas combined with points are also used to indicate the depth of a column of type upon a page".

MODULE 7

The Basic Terminology

8.

Display I.D.

Course:
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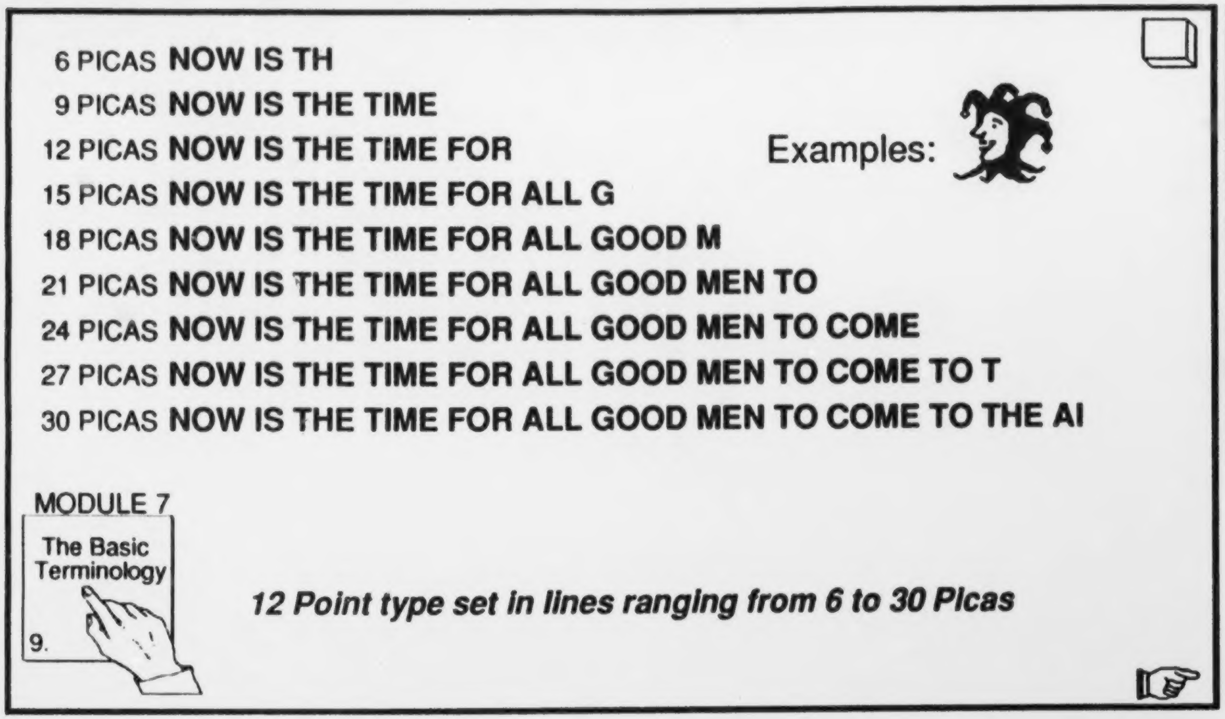
April 1989

Sequence:

COMMENTS:



6 PICAS **NOW IS TH**
9 PICAS **NOW IS THE TIME**
12 PICAS **NOW IS THE TIME FOR**
15 PICAS **NOW IS THE TIME FOR ALL G**
18 PICAS **NOW IS THE TIME FOR ALL GOOD M**
21 PICAS **NOW IS THE TIME FOR ALL GOOD MEN TO**
24 PICAS **NOW IS THE TIME FOR ALL GOOD MEN TO COME**
27 PICAS **NOW IS THE TIME FOR ALL GOOD MEN TO COME TO T**
30 PICAS **NOW IS THE TIME FOR ALL GOOD MEN TO COME TO THE AI**

Examples:

MODULE 7

The Basic Terminology

9.

12 Point type set in lines ranging from 6 to 30 Picas

Display I.D.

Course:
Type Tutorial

Author:
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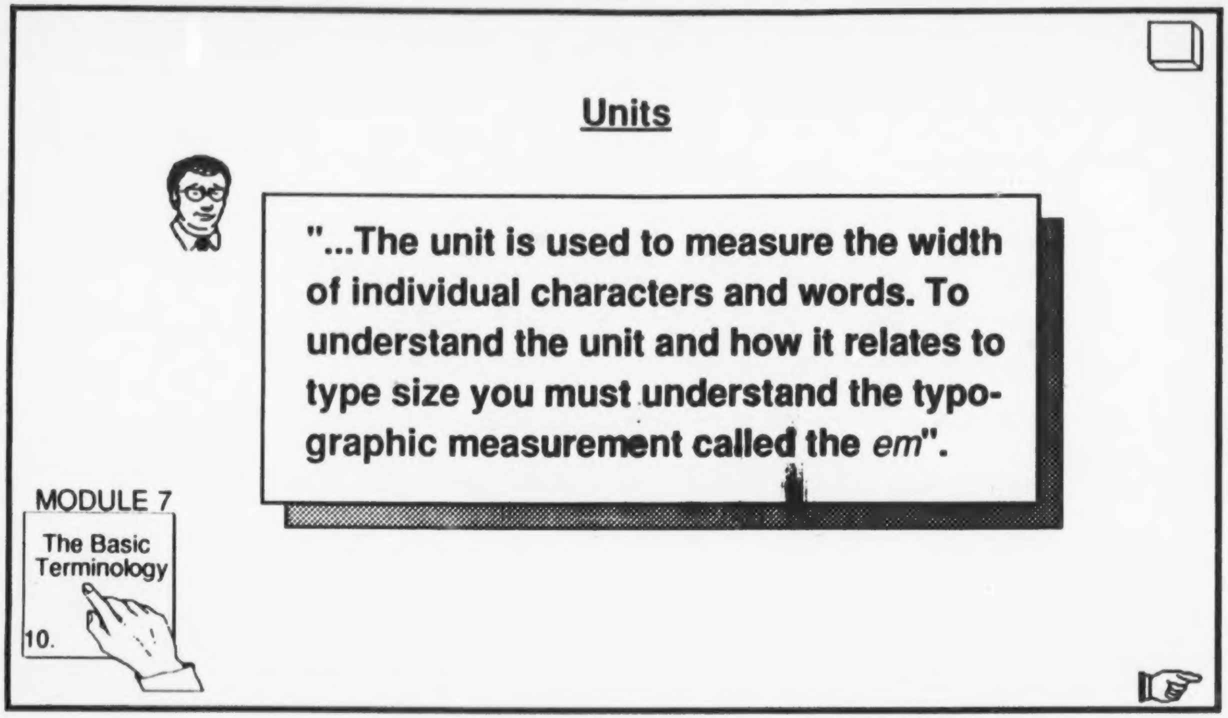
Date:
April 1989

Sequence:

COMMENTS:



Units

"...The unit is used to measure the width of individual characters and words. To understand the unit and how it relates to type size you must understand the typographic measurement called the *em*".

MODULE 7

The Basic Terminology

10.

Display I.D.

Course:
Type Tutorial

Author:
Andrew Gelfand

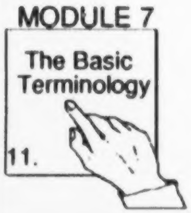
Date:
April 1989

Sequence:

COMMENTS:

Units and the Em

..."an *em,* is the square of the type size being used. A 36 point em for instance, is a 36 point square and a 72 point em is a 72 point square. By subdividing the em into vertical segments we derive what are called units".



Display I.D.

Course:
Type Tutorial

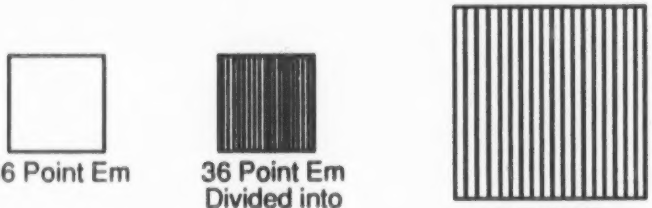
Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:

..."there are a number of unit systems in use including 36,48,54, and 72 units to the em. The greater the number of units to the em, the greater the possibilities of typographic refinement".


36 Point Em
36 Point Em Divided into 18 Units
72 Point Em Divided into 18 Units

MODULE 7

The Basic Terminology

11.

Display I.D.

Course: Type Tutorial

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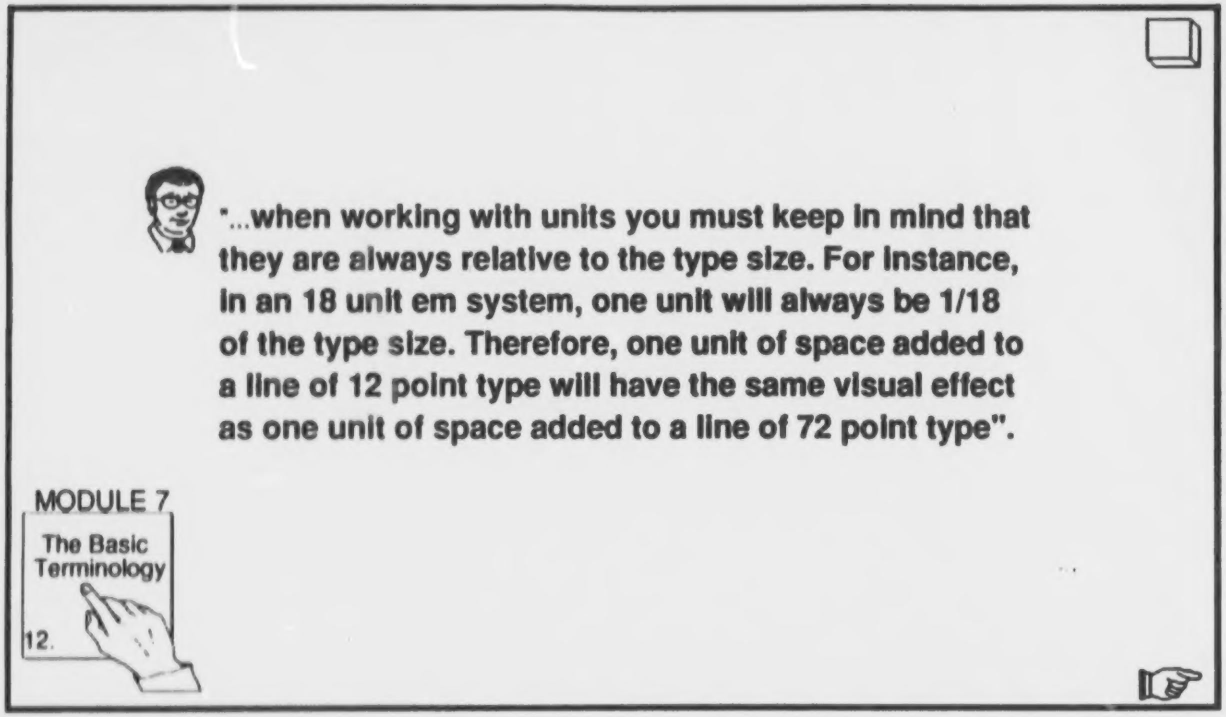
Date: April 1989

Sequence:

COMMENTS:



"...when working with units you must keep in mind that they are always relative to the type size. For instance, in an 18 unit em system, one unit will always be 1/18 of the type size. Therefore, one unit of space added to a line of 12 point type will have the same visual effect as one unit of space added to a line of 72 point type".

Display I.D.

Course:
Type Tutorial

Author:
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Date:
April 1989

Sequence:

COMMENTS:

Units and Set Width

"...When typefaces are designed each character is alloted a fixed amount of space measurable in units. This dimension is called the *set-width,* the *set size,* or simply the *set* of the character, and includes a small amount of space on either side to prevent the characters from touching one another".

MODULE 7

The Basic Terminology

13.

Display I.D.

Course:
Type Tutorial

Author:
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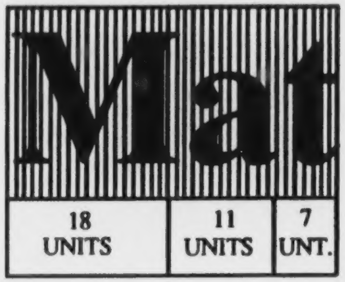
Date:
April 1989

Sequence:

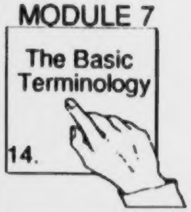
COMMENTS:

..."the wider the character, the greater the set-width. For example a capital "M" may be 18 units wide, while a lower case "a" may be 10 units wide; a lowercase "+" sign 6 units wide; and a period only 3 units wide. The set width, when expressed in units, is referred to as the *unit value* of the character".


Mat
18 UNITS
11 UNITS
7 UNT.

Set Width for three characters.

MODULE 7


The Basic Terminology
14.

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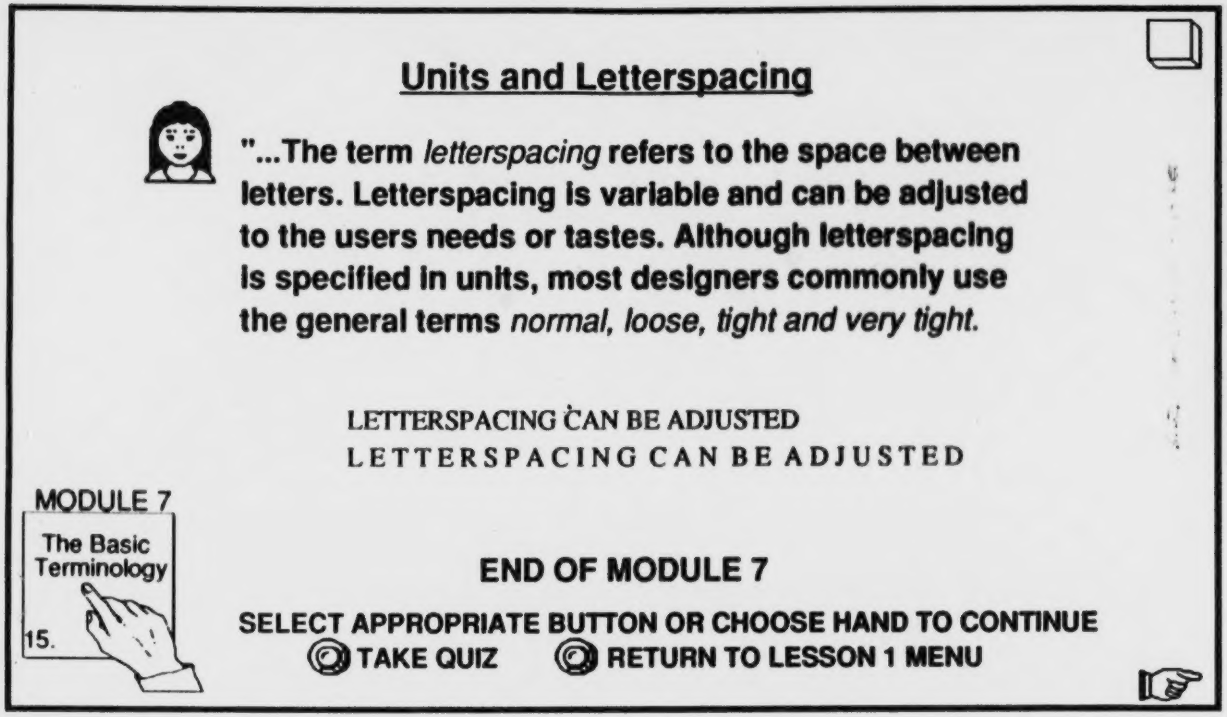
Sequence:

COMMENTS:



Units and Letterspacing

"...The term *letterspacing* refers to the space between letters. Letterspacing is variable and can be adjusted to the users needs or tastes. Although letterspacing is specified in units, most designers commonly use the general terms *normal, loose, tight and very tight.*

LETTERSPACING CAN BE ADJUSTED
LETTERSPACING CAN BE ADJUSTED

MODULE 7

The Basic Terminology

15.

END OF MODULE 7

SELECT APPROPRIATE BUTTON OR CHOOSE HAND TO CONTINUE

○ **TAKE QUIZ** ○ **RETURN TO LESSON 1 MENU**

Display I.D..

Course:
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Date:
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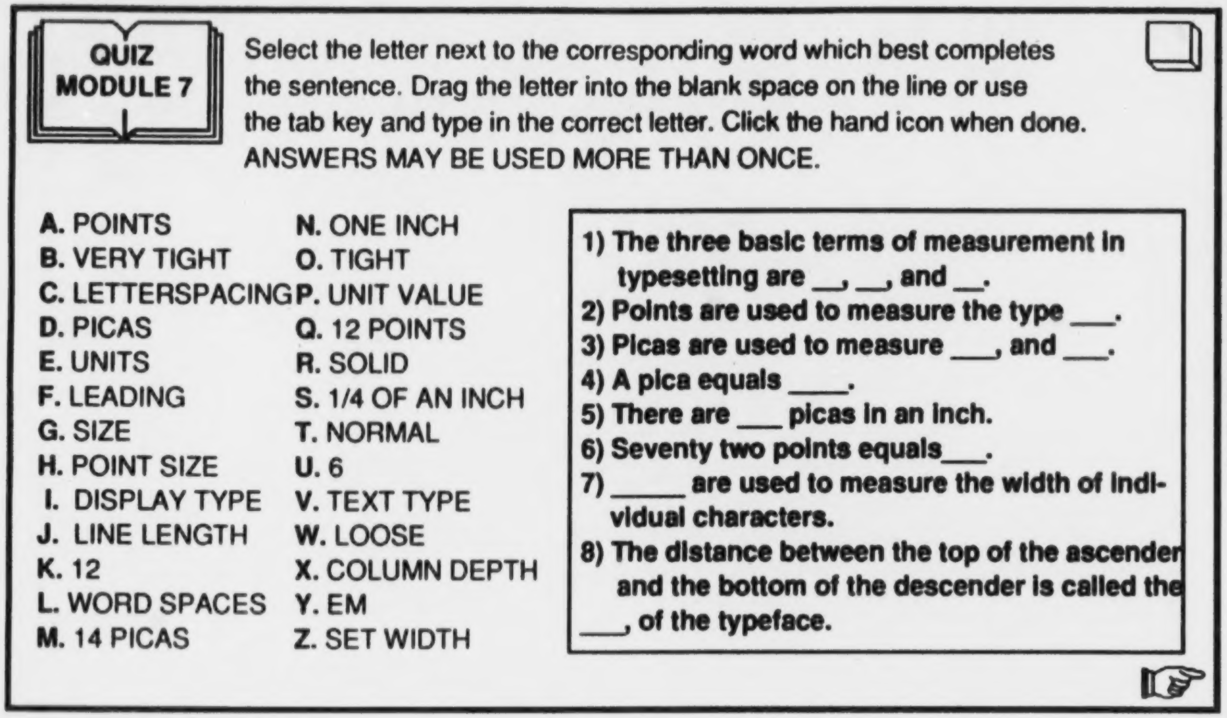
Sequence:

COMMENTS:



QUIZ MODULE 7

Select the letter next to the corresponding word which best completes the sentence. Drag the letter into the blank space on the line or use the tab key and type in the correct letter. Click the hand icon when done. ANSWERS MAY BE USED MORE THAN ONCE.

A. POINTS
B. VERY TIGHT
C. LETTERSPACING
D. PICAS
E. UNITS
F. LEADING
G. SIZE
H. POINT SIZE
I. DISPLAY TYPE
J. LINE LENGTH
K. 12
L. WORD SPACES
M. 14 PICAS
N. ONE INCH
O. TIGHT
P. UNIT VALUE
Q. 12 POINTS
R. SOLID
S. 1/4 OF AN INCH
T. NORMAL
U. 6
V. TEXT TYPE
W. LOOSE
X. COLUMN DEPTH
Y. EM
Z. SET WIDTH

1) The three basic terms of measurement in typesetting are __, __, and __.
2) Points are used to measure the type ___.
3) Picas are used to measure ___, and ___.
4) A pica equals ____.
5) There are ___ picas in an inch.
6) Seventy two points equals___.
7) _____ are used to measure the width of individual characters.
8) The distance between the top of the ascender and the bottom of the descender is called the ___, of the typeface.

Display I.D.

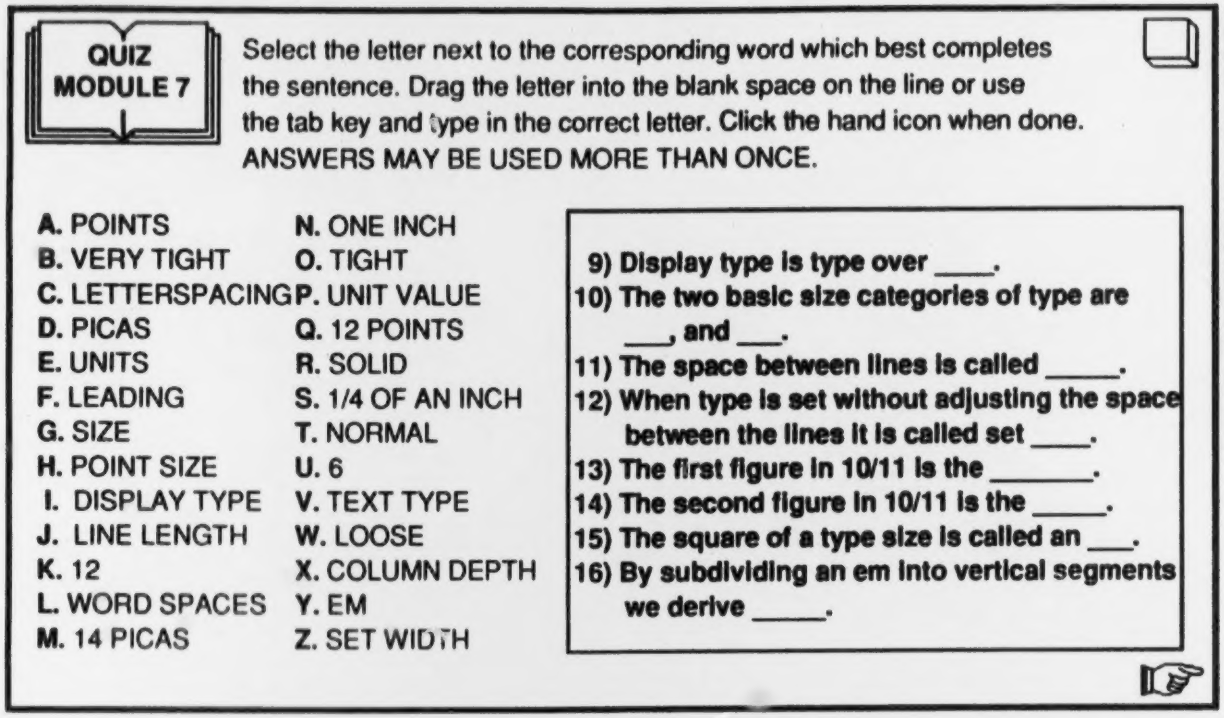
Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:



QUIZ MODULE 7

Select the letter next to the corresponding word which best completes the sentence. Drag the letter into the blank space on the line or use the tab key and type in the correct letter. Click the hand icon when done. ANSWERS MAY BE USED MORE THAN ONCE.

A. POINTS
B. VERY TIGHT
C. LETTERSPACING
D. PICAS
E. UNITS
F. LEADING
G. SIZE
H. POINT SIZE
I. DISPLAY TYPE
J. LINE LENGTH
K. 12
L. WORD SPACES
M. 14 PICAS
N. ONE INCH
O. TIGHT
P. UNIT VALUE
Q. 12 POINTS
R. SOLID
S. 1/4 OF AN INCH
T. NORMAL
U. 6
V. TEXT TYPE
W. LOOSE
X. COLUMN DEPTH
Y. EM
Z. SET WIDTH

9) Display type is type over ____.
10) The two basic size categories of type are ___, and ___.
11) The space between lines is called _____.
12) When type is set without adjusting the space between the lines it is called set ____.
13) The first figure in 10/11 is the _______.
14) The second figure in 10/11 is the _____.
15) The square of a type size is called an ___.
16) By subdividing an em into vertical segments we derive _____.

Display I.D.

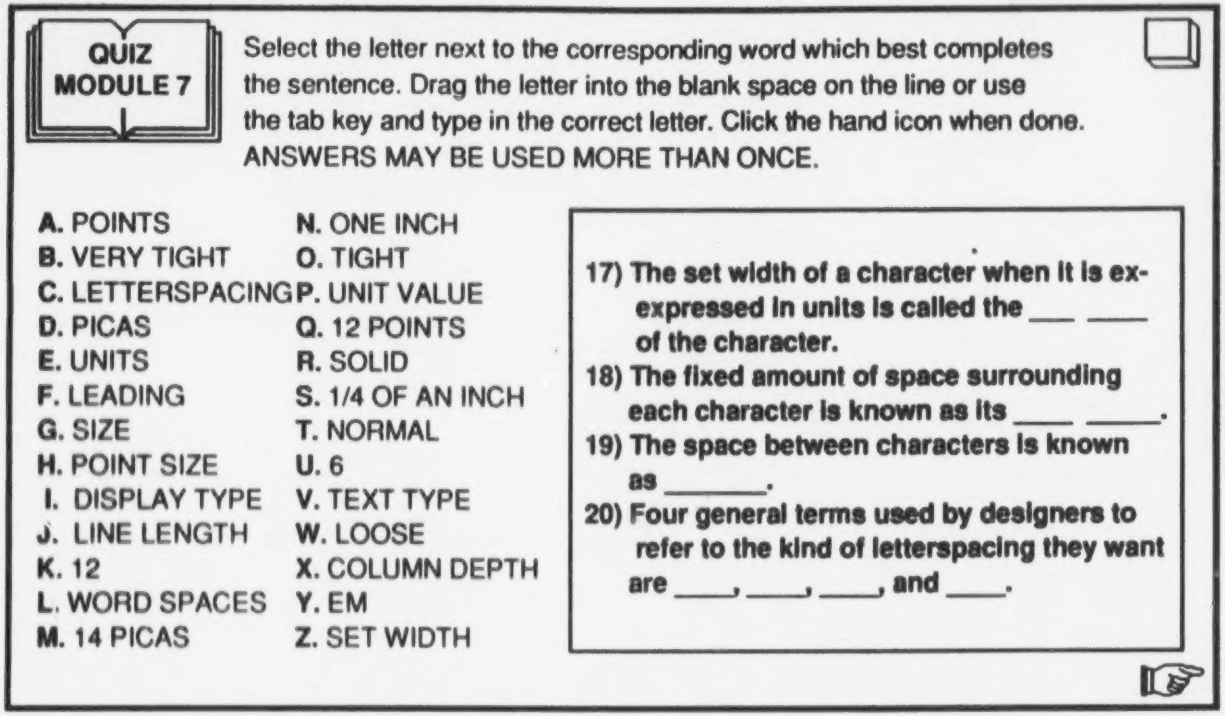
Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:



QUIZ MODULE 7

Select the letter next to the corresponding word which best completes the sentence. Drag the letter into the blank space on the line or use the tab key and type in the correct letter. Click the hand icon when done. ANSWERS MAY BE USED MORE THAN ONCE.

A. POINTS
B. VERY TIGHT
C. LETTERSPACING
D. PICAS
E. UNITS
F. LEADING
G. SIZE
H. POINT SIZE
I. DISPLAY TYPE
J. LINE LENGTH
K. 12
L. WORD SPACES
M. 14 PICAS
N. ONE INCH
O. TIGHT
P. UNIT VALUE
Q. 12 POINTS
R. SOLID
S. 1/4 OF AN INCH
T. NORMAL
U. 6
V. TEXT TYPE
W. LOOSE
X. COLUMN DEPTH
Y. EM
Z. SET WIDTH

17) The set width of a character when it is ex- expressed in units is called the ___ ____ of the character.

18) The fixed amount of space surrounding each character is known as its ____ _____.

19) The space between characters is known as _______.

20) Four general terms used by designers to refer to the kind of letterspacing they want are ____, ____, ____, and ____.

☞

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Course:
Type Tutorial

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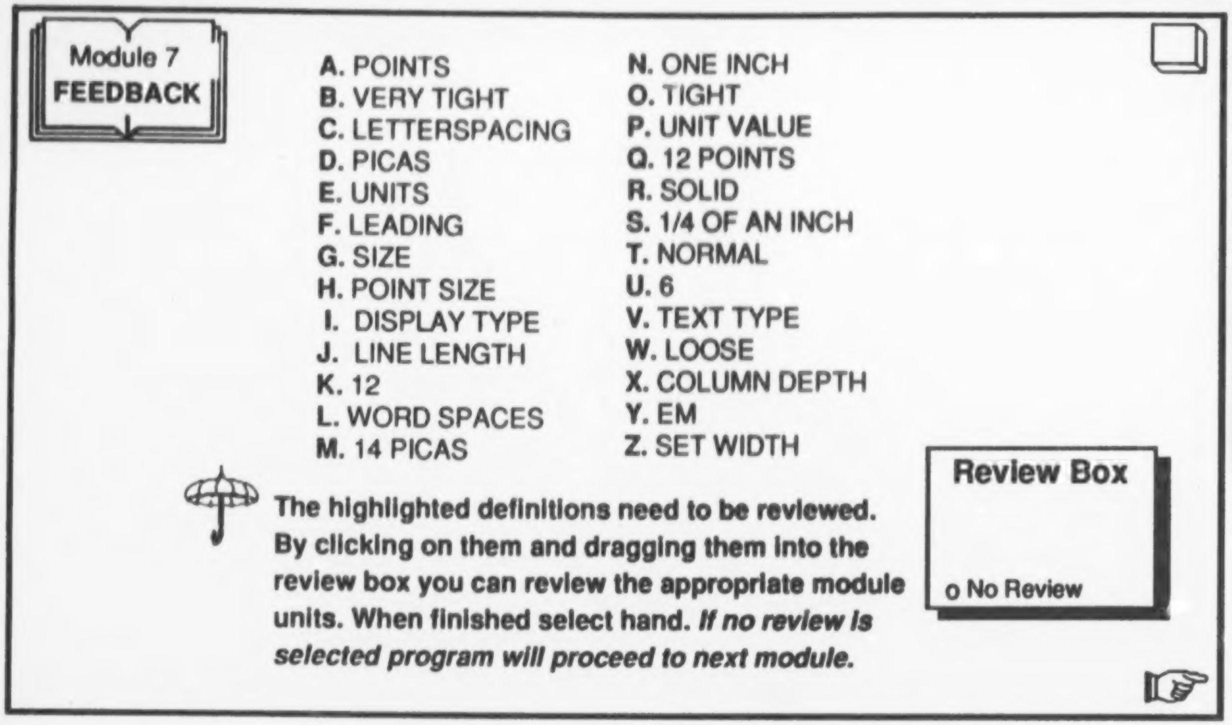
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:



Module 7
FEEDBACK

A. POINTS
B. VERY TIGHT
C. LETTERSPACING
D. PICAS
E. UNITS
F. LEADING
G. SIZE
H. POINT SIZE
I. DISPLAY TYPE
J. LINE LENGTH
K. 12
L. WORD SPACES
M. 14 PICAS
N. ONE INCH
O. TIGHT
P. UNIT VALUE
Q. 12 POINTS
R. SOLID
S. 1/4 OF AN INCH
T. NORMAL
U. 6
V. TEXT TYPE
W. LOOSE
X. COLUMN DEPTH
Y. EM
Z. SET WIDTH

Review Box

○ No Review

The highlighted definitions need to be reviewed. By clicking on them and dragging them into the review box you can review the appropriate module units. When finished select hand. *If no review is selected program will proceed to next module.*

Display I.D.

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Type Tutorial

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Date:
April 1989

Sequence:

COMMENTS:

MODULE 8

JUSTIFICATION

Typing or setting text lines to the same length so that they line up on the left and right hand page or column margins is known as justification.

Justification is accomplished by filling a line until the last possible word or syllable fits and then dividing the remaining space by the total number of word spaces. The result is then distributed at each word space. This is why word spaces vary in width from line to line.

The Basic Terminology
1.

Display I.D.

Course:
Type Tutorial

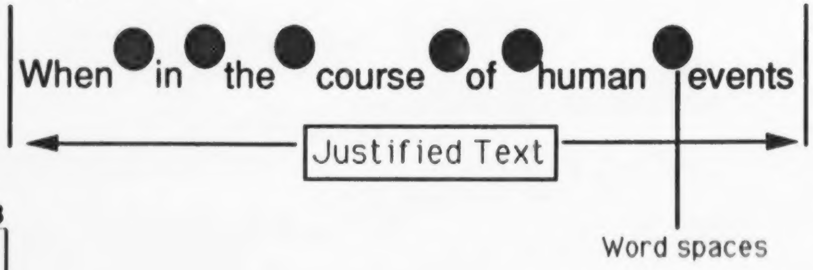
Author:
Andrew Gelfand

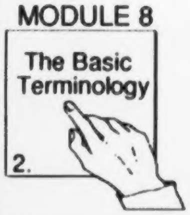
Date:
April 1989

Sequence:

COMMENTS:

Word spaces are variable in width, expanding or contracting as needed to space the line out to its justification width. For example:


When ● in ● the ● course ● of ● human ● events
Justified Text
Word spaces


MODULE 8
The Basic Terminology
2.

Display I.D.

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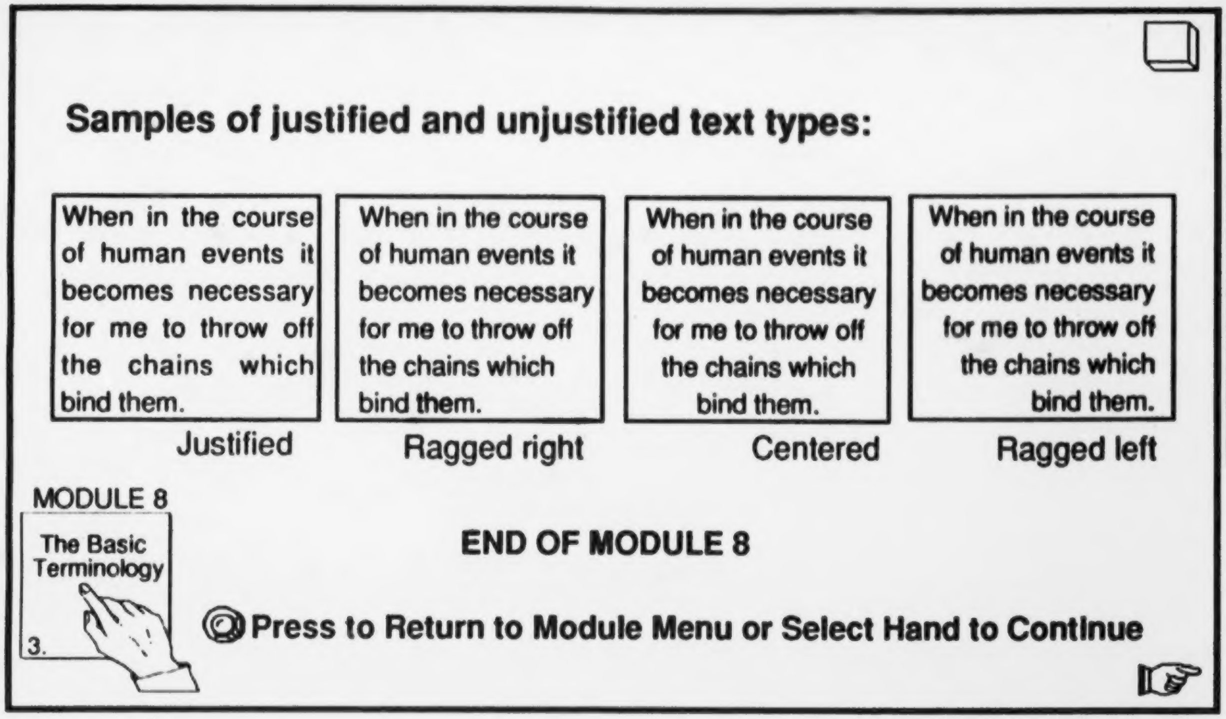

Samples of justified and unjustified text types:

When in the course of human events it becomes necessary for me to throw off the chains which bind them.

Justified

When in the course
of human events it
becomes necessary
for me to throw off
the chains which
bind them.

Ragged right

When in the course
of human events it
becomes necessary
for me to throw off
the chains which
bind them.

Centered

When in the course
of human events it
becomes necessary
for me to throw off
the chains which
bind them.

Ragged left

END OF MODULE 8

Press to Return to Module Menu or Select Hand to Continue

Display I.D.

Course: Type Tutorial

Author: Andrew Gelfand

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Sequence:

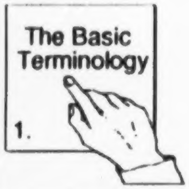
COMMENTS:

MODULE 9

KERNING

The use of negative letterspacing between specific character combinations in order to reduce the space between them is known as kerning.

Kerning is an optical function, whereby the space between certain letter combinations is reduced until the desired effect is achieved.



Display I.D.

Course:
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Author:
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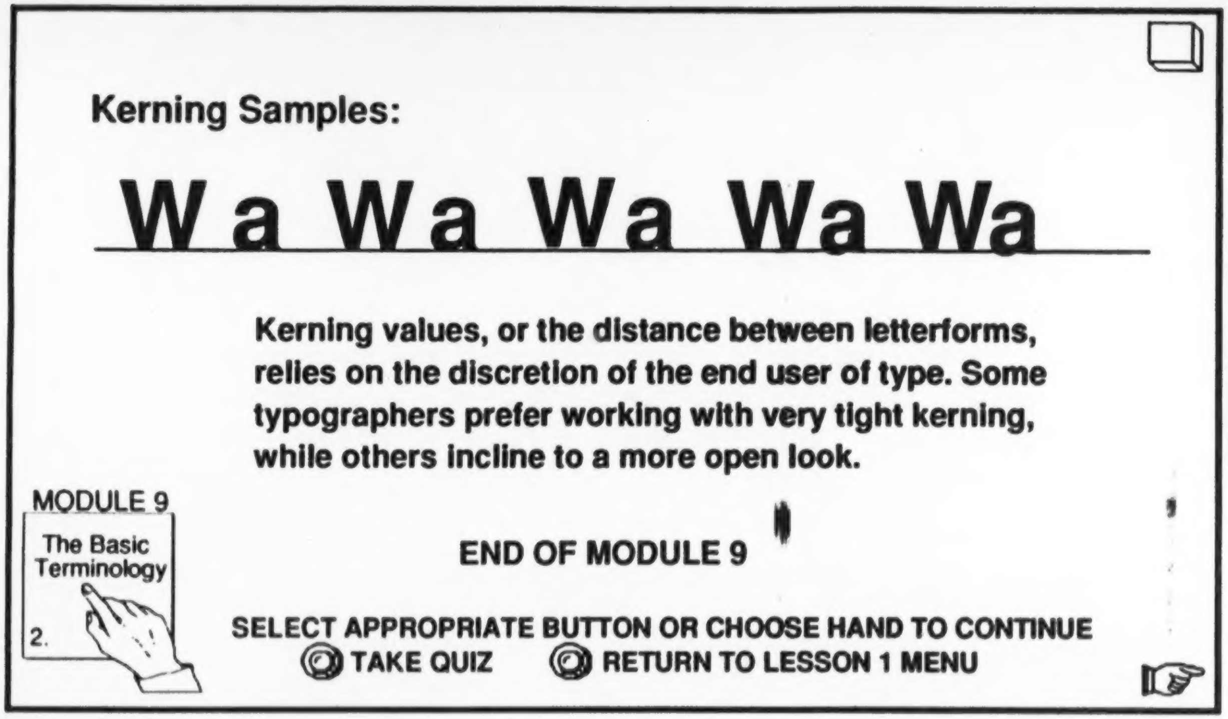
Sequence:

COMMENTS:



Kerning Samples:

W a Wa Wa Wa Wa

Kerning values, or the distance between letterforms, relies on the discretion of the end user of type. Some typographers prefer working with very tight kerning, while others incline to a more open look.

END OF MODULE 9

SELECT APPROPRIATE BUTTON OR CHOOSE HAND TO CONTINUE

MODULE 9
The Basic Terminology
2.
◎ TAKE QUIZ
◎ RETURN TO LESSON 1 MENU

Display I.D.

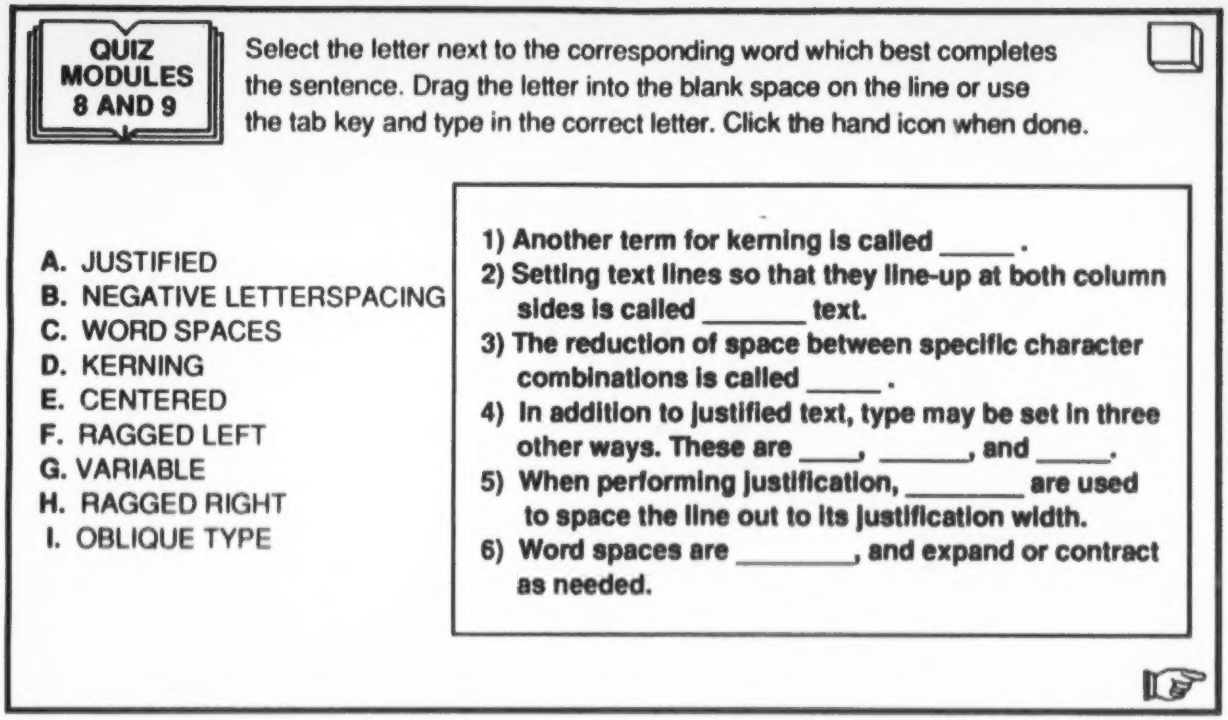
Course: Type Tutorial

Author: Andrew Gelfand

Date: April 1989

Sequence:

COMMENTS:



QUIZ MODULES 8 AND 9

Select the letter next to the corresponding word which best completes the sentence. Drag the letter into the blank space on the line or use the tab key and type in the correct letter. Click the hand icon when done.

A. JUSTIFIED
B. NEGATIVE LETTERSPACING
C. WORD SPACES
D. KERNING
E. CENTERED
F. RAGGED LEFT
G. VARIABLE
H. RAGGED RIGHT
I. OBLIQUE TYPE

1) Another term for kerning is called _____ .
2) Setting text lines so that they line-up at both column sides is called _______ text.
3) The reduction of space between specific character combinations is called _____ .
4) In addition to justified text, type may be set in three other ways. These are ____, ______, and _____.
5) When performing justification, ________ are used to space the line out to its justification width.
6) Word spaces are ________, and expand or contract as needed.

Display I.D.

Course:
Type Tutorial

Author:
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April 1989

Sequence:

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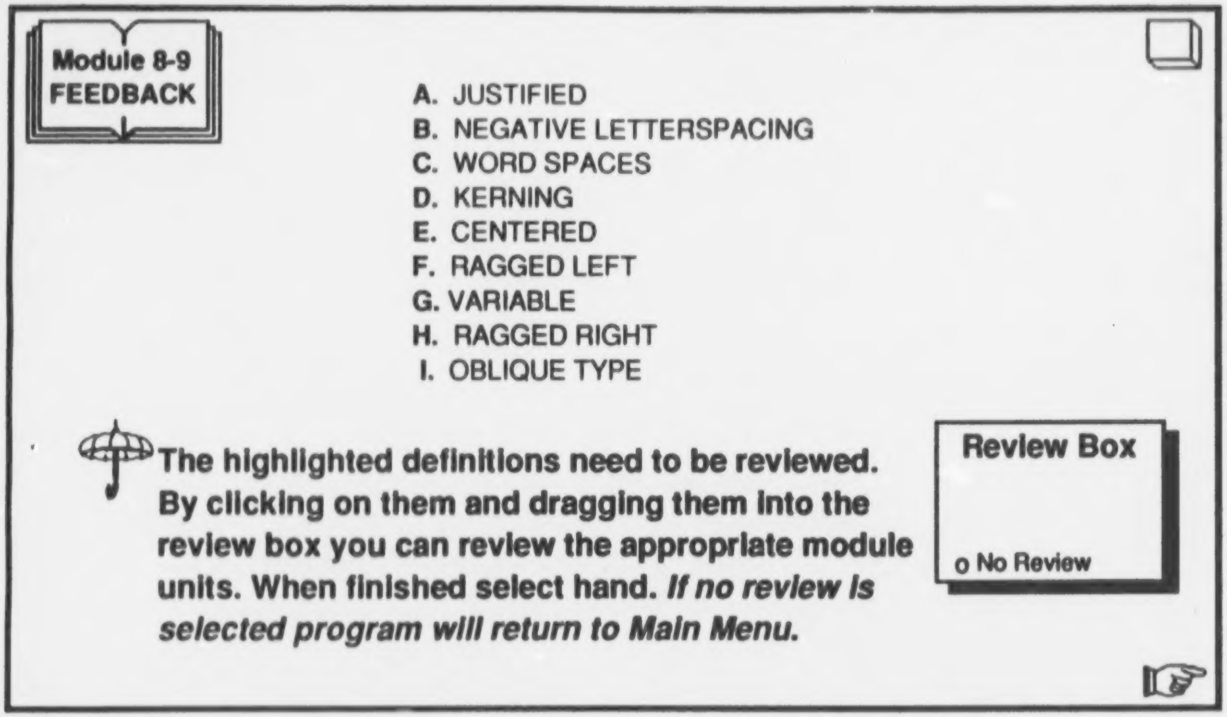


Module 8-9
FEEDBACK

- A. JUSTIFIED
- B. NEGATIVE LETTERSPACING
- C. WORD SPACES
- D. KERNING
- E. CENTERED
- F. RAGGED LEFT
- G. VARIABLE
- H. RAGGED RIGHT
- I. OBLIQUE TYPE

The highlighted definitions need to be reviewed. By clicking on them and dragging them into the review box you can review the appropriate module units. When finished select hand. ***If no review is selected program will return to Main Menu.***

Review Box

○ No Review

Display I.D.

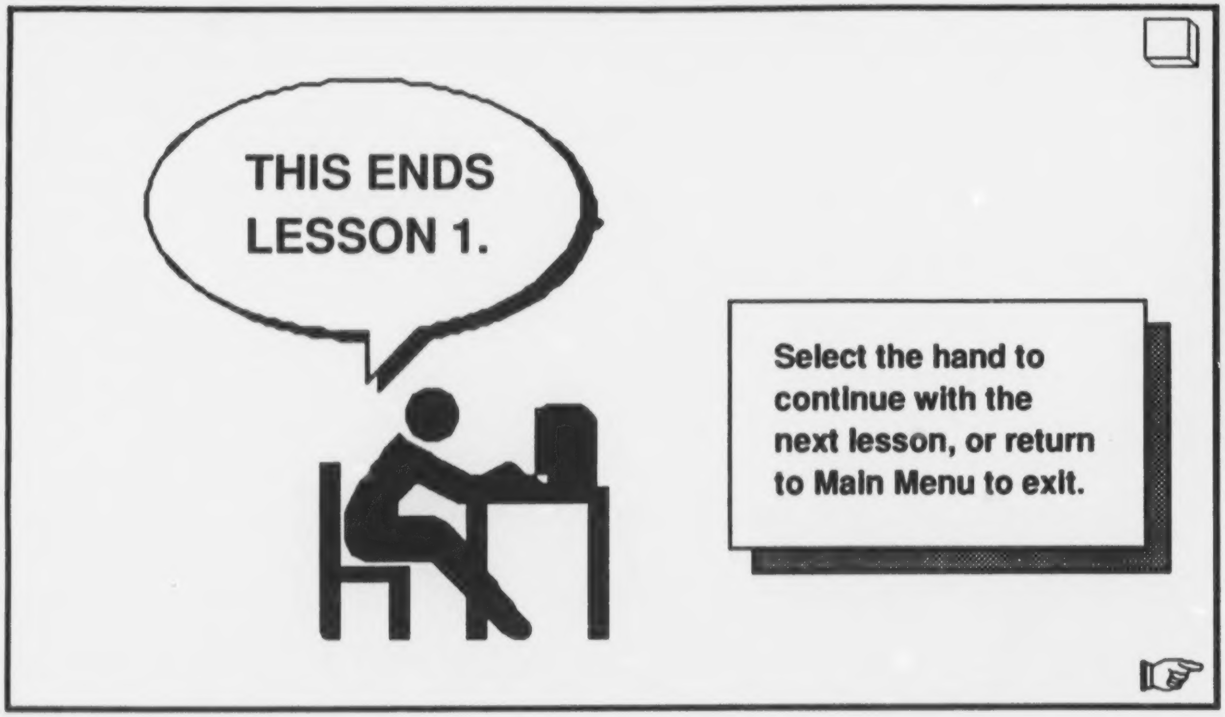
Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:



THIS ENDS LESSON 1.

Select the hand to continue with the next lesson, or return to Main Menu to exit.

Display I.D.

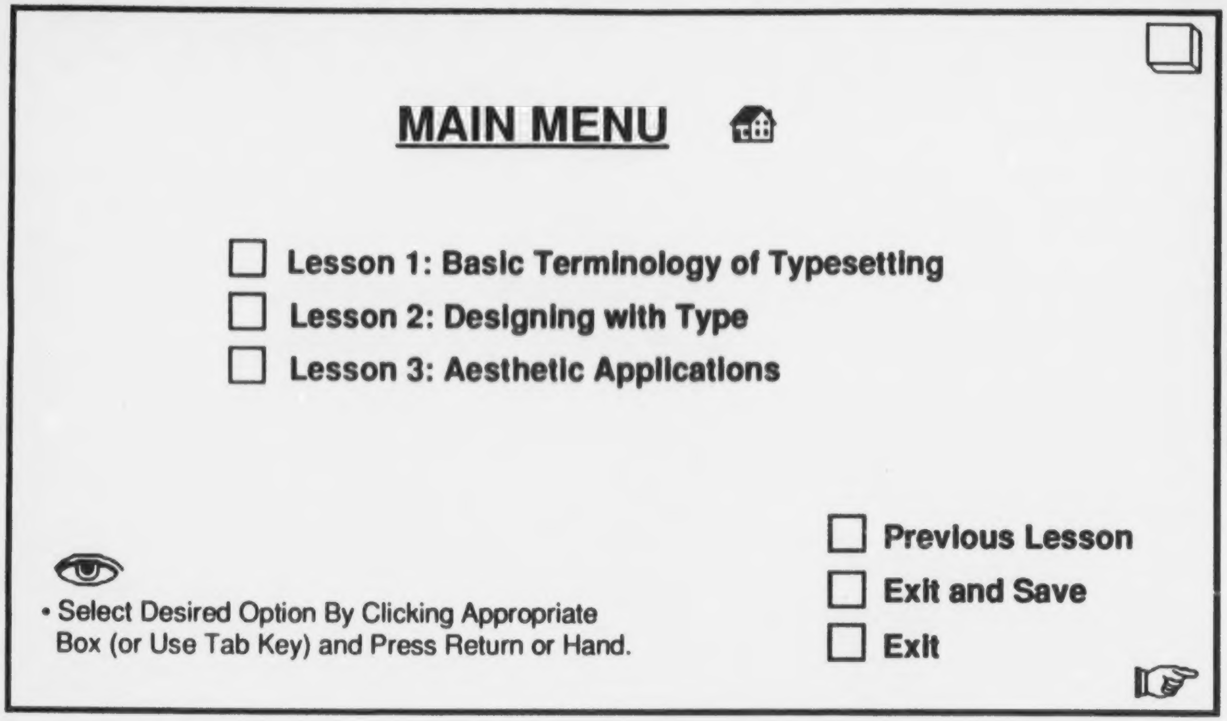
Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:



MAIN MENU

☐ Lesson 1: Basic Terminology of Typesetting
☐ Lesson 2: Designing with Type
☐ Lesson 3: Aesthetic Applications

☐ Previous Lesson
☐ Exit and Save
☐ Exit

- Select Desired Option By Clicking Appropriate Box (or Use Tab Key) and Press Return or Hand.

Display I.D.
Main Menu

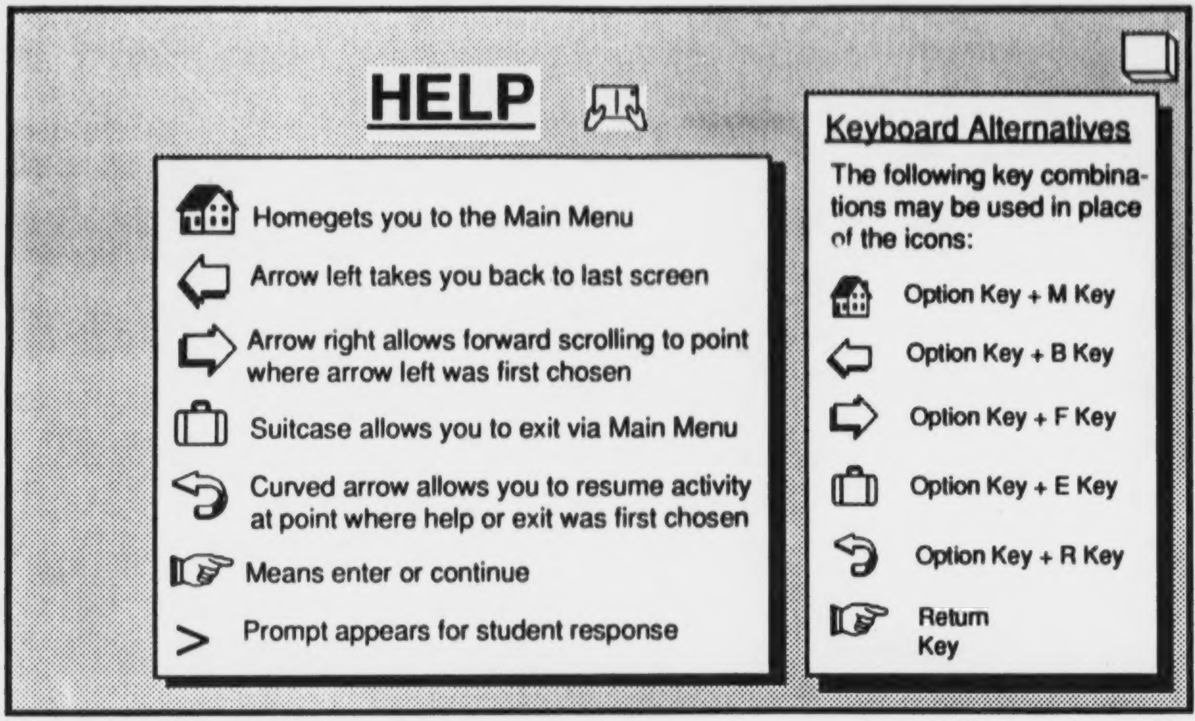
Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:
MM

COMMENTS:



HELP

- ⌂ Homegets you to the Main Menu
- ⇦ Arrow left takes you back to last screen
- ⇨ Arrow right allows forward scrolling to point where arrow left was first chosen
- 💼 Suitcase allows you to exit via Main Menu
- ↶ Curved arrow allows you to resume activity at point where help or exit was first chosen
- ☞ Means enter or continue
- > Prompt appears for student response

Keyboard Alternatives

The following key combinations may be used in place of the icons:

⌂	Option Key + M Key
⇦	Option Key + B Key
⇨	Option Key + F Key
💼	Option Key + E Key
↶	Option Key + R Key
☞	Return Key

Display I.D.
Help Menu

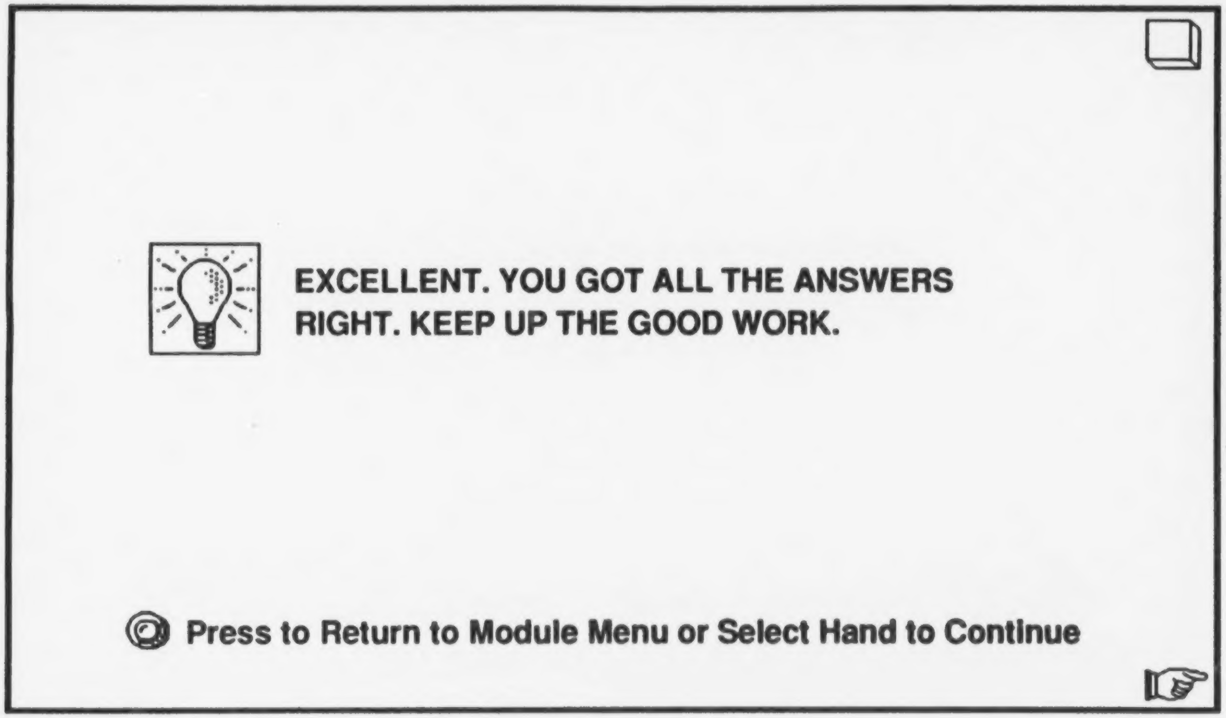
Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:
HM

COMMENTS:



EXCELLENT. YOU GOT ALL THE ANSWERS RIGHT. KEEP UP THE GOOD WORK.

◎ Press to Return to Module Menu or Select Hand to Continue

Display I.D.

Course:
Type Tutorial

Author:
Andrew Gelfand

Date:
April 1989

Sequence:

COMMENTS:

MESSAGE CENTER INDEX

E1: "PLEASE PRESS RETURN KEY OR CLICK ON HAND"
E2: "THANK YOU"
E3: "UNRECOGNIZED CHARACTER. PLEASE USE APPROPRIATE RESPONSE"
E4: "YOU HAVE NOT COMPLETED THE FULL QUESTION SET. COMPLETE OR SELECT HAND TO CANCEL"
E5: "YOUR RESPONSE FALLS OUTSIDE OF AVAILABLE CHOICES. PLEASE RE-ENTER"
E6: "YOU HAVE NOT SELECTED ALL HIGHLIGHTED ITEMS. COMPLETE SELECTION OR CLICK HAND TO CANCEL.

.....THIS IS THE PROGRAM MESSAGE CENTER.............

Display I.D.

Course:
Type Tutorial

Author:
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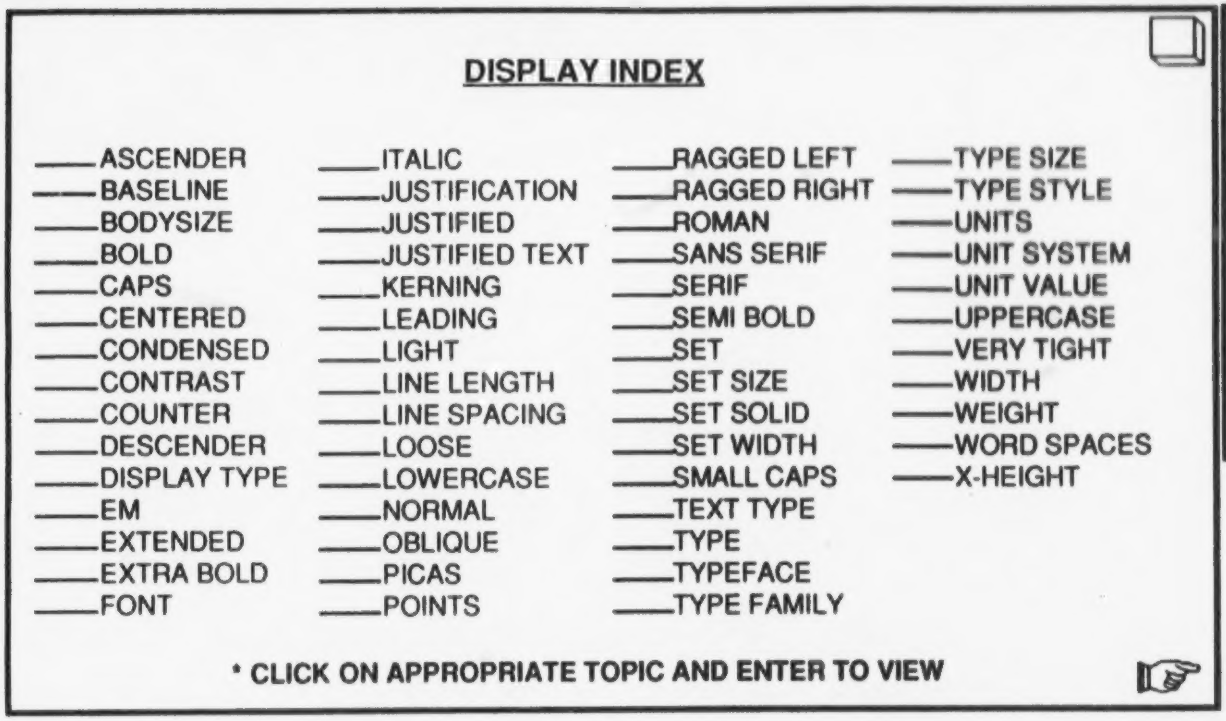
Date:
April 1989

Sequence:

COMMENTS:



DISPLAY INDEX

____ASCENDER
____BASELINE
____BODYSIZE
____BOLD
____CAPS
____CENTERED
____CONDENSED
____CONTRAST
____COUNTER
____DESCENDER
____DISPLAY TYPE
____EM
____EXTENDED
____EXTRA BOLD
____FONT
____ITALIC
____JUSTIFICATION
____JUSTIFIED
____JUSTIFIED TEXT
____KERNING
____LEADING
____LIGHT
____LINE LENGTH
____LINE SPACING
____LOOSE
____LOWERCASE
____NORMAL
____OBLIQUE
____PICAS
____POINTS
____RAGGED LEFT
____RAGGED RIGHT
____ROMAN
____SANS SERIF
____SERIF
____SEMI BOLD
____SET
____SET SIZE
____SET SOLID
____SET WIDTH
____SMALL CAPS
____TEXT TYPE
____TYPE
____TYPEFACE
____TYPE FAMILY
____TYPE SIZE
____TYPE STYLE
____UNITS
____UNIT SYSTEM
____UNIT VALUE
____UPPERCASE
____VERY TIGHT
____WIDTH
____WEIGHT
____WORD SPACES
____X-HEIGHT

* CLICK ON APPROPRIATE TOPIC AND ENTER TO VIEW

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COMMENTS:

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